1.0 Subbasin Assessment – Watershed Characterization

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the CWA, are to adopt water quality standards (WQS) necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Weiser River Watershed that have been placed on what is known as the "§303(d) list."

The overall purpose of this subbasin assessment and TMDL is to characterize and document pollutant loads within the Weiser River Watershed. The first portion of this document, the subbasin assessment, is partitioned into four major sections: watershed characterization, water quality concerns and status, pollutant source inventory, and a summary of past and present pollution control efforts (Sections 1 – 4). This information will then be used to develop a TMDL for each pollutant of concern for the Weiser River Watershed (Section 5).

1.1 Introduction

In 1972, Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The federal government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Department of Environmental Quality (DEQ) implements the CWA in Idaho, while EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Section 303 of the CWA requires DEQ to adopt, with EPA approval, water quality standards and to review those standards every three years. Additionally, DEQ must monitor waters to identify those not meeting water quality standards. For those waters not meeting standards, DEQ must establish TMDLs for each pollutant impairing the waters. Further, the agency must set appropriate controls to restore water quality and allow the water bodies to meet their designated uses. These requirements result in a list of impaired waters called the "§303(d) list." This list describes water bodies not meeting water quality standards. Waters identified on this list require further analysis. A subbasin assessment (SBA) and TMDL provide a summary of the water quality status and allowable TMDL for water bodies on the §303(d) list. The *Weiser River Watershed Subbasin Assessment and Total Maximum Daily Loads* provides this summary for the currently listed waters in the Weiser River Watershed.

The SBA section of this report (Sections 1 – 4) includes an evaluation and summary of the current water quality status, pollutant sources, and control actions in the Weiser River Watershed to date. While this assessment is not a requirement of the TMDL, DEQ performs the assessment to ensure impairment listings are up to date and accurate. The TMDL is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (Water quality planning and management, 40 CFR 130). Consequently, a TMDL is water body- and pollutant-specific. The TMDL also includes individual pollutant allocations among various sources discharging the pollutant. EPA considers certain unnatural conditions, such as flow alteration, a lack of flow, or habitat alteration, that are not the result of the discharge of specific pollutants as "pollution." A TMDL is not required for a water body impaired by pollution, but not specific pollutants. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Idaho's Role

Idaho adopts water quality standards to protect public health and welfare, enhance the quality of water, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in the Idaho water quality standards and include:

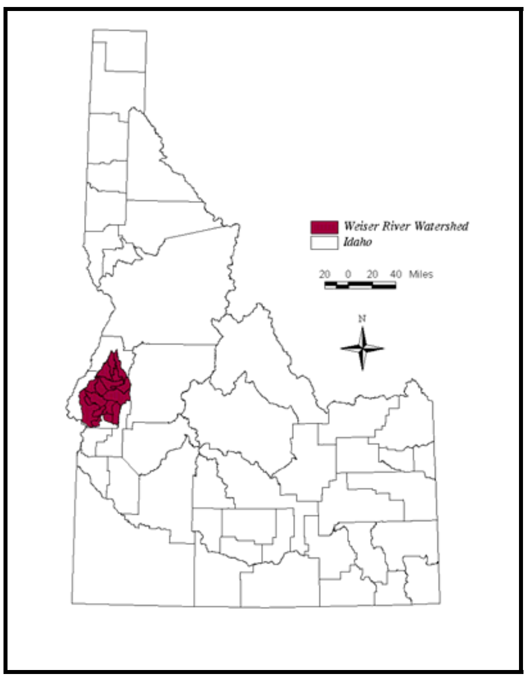
- Aquatic life support – cold water, seasonal cold water, warm water, salmonid spawning, modified

- Contact recreation – primary (swimming), secondary (boating)
- Water supply – domestic, agricultural, industrial
- Wildlife habitats, aesthetics

The Idaho legislature designates uses for water bodies. Industrial water supply, wildlife habitat, and aesthetics are designated beneficial uses for all water bodies in the state. If a water body is unclassified, then cold water and primary contact recreation are used as additional default designated uses when water bodies are assessed.

An SBA entails analyzing and integrating multiple types of water body data, such as biological, physical/chemical, and landscape data to address several objectives:

- Determine the degree of designated beneficial use support of the water body (i.e., attaining or not attaining water quality standards).
- Determine the degree of achievement of biological integrity.
- Compile descriptive information about the water body, particularly the identity and location of pollutant sources.
- When water bodies are not attaining water quality standards, determine the causes and extent of the impairment.



Weiser River Watershed

HUC:	17050124
Water Bodies:	Weiser River (3 Sections), West Fork Weiser River, Little Weiser River, Mann Creek, Cove Creek, Johnson Creek, Crane Creek, North Crane Creek, South Crane Creek, and Crane Creek Reservoir
Pollutant Sources:	Point and Nonpoint Sources
Ecoregions:	Snake River-High Desert, Blue Mountains
Size:	1,077,048 Acres

Figure 1. Subbasin at a Glance. Weiser River Watershed.

1.2 Physical and Biological Characteristics

The Weiser River Watershed is located in southwestern Idaho and is a major tributary to the Snake River (Figure 1). The hydrologic unit code (HUC) is 17050124. The river has a general hydrological flow from north to south. The Weiser River's confluence with the Snake River is near river mile 352. The watershed originates in the southern end of the Seven Devils Mountain Range in the Blue Mountain Ecoregion and drains generally south into the Snake River-High Desert Ecoregion of southwestern Idaho.

Overall there are only three large impoundments in the watershed that would have any type of influence on water discharge and flows: Lost Valley Creek Reservoir, Mann Creek Reservoir, and Crane Creek Reservoir. However, none of these impoundments have much influence on controlling spring snowmelt or widespread flooding, and all have a primary purpose for irrigation water storage. Figure 2 shows the location of the Weiser River Watershed. Figure 3 shows the overall hydrology of the watershed.

Land ownership is diverse, with private and public lands throughout the watershed. The watershed is entirely within Idaho, with no recognized tribal lands within the watershed. Land use is also diverse, with irrigated cropland, irrigated pasture, dry land agriculture, upland rangeland, forested areas, municipalities, and flood prone river bottom riparian areas.

The major municipalities in the watershed are the cities of Weiser, Midvale, Cambridge, and Council. However, most of the population is associated with agricultural homesteads on private lands.

Point sources of pollutants in the watershed consist of municipal discharges from wastewater treatment plants (WWTPs) and animal feeding operations. Animal feeding operations may or may not be National Pollution Discharge Elimination System (NPDES) permitted facilities. , but the WWTPs are permitted facilities. The City of Midvale does not have a WWTP, and the City of Weiser's WWTP discharges to the Snake River downstream of the confluence of the Weiser River.

The elevation in the watershed ranges from approximately 700 meters (2,300 feet) near the confluence with the Snake River to approximately 2,500 meters (8,100 feet) at Council and West Mountain. The topography can range from steeply sloped, forested mountains in the higher elevations, to relatively shallow slopes in the lower elevations and river bottom lands, to relatively flat terraces and benches associated with alluvial deposits.

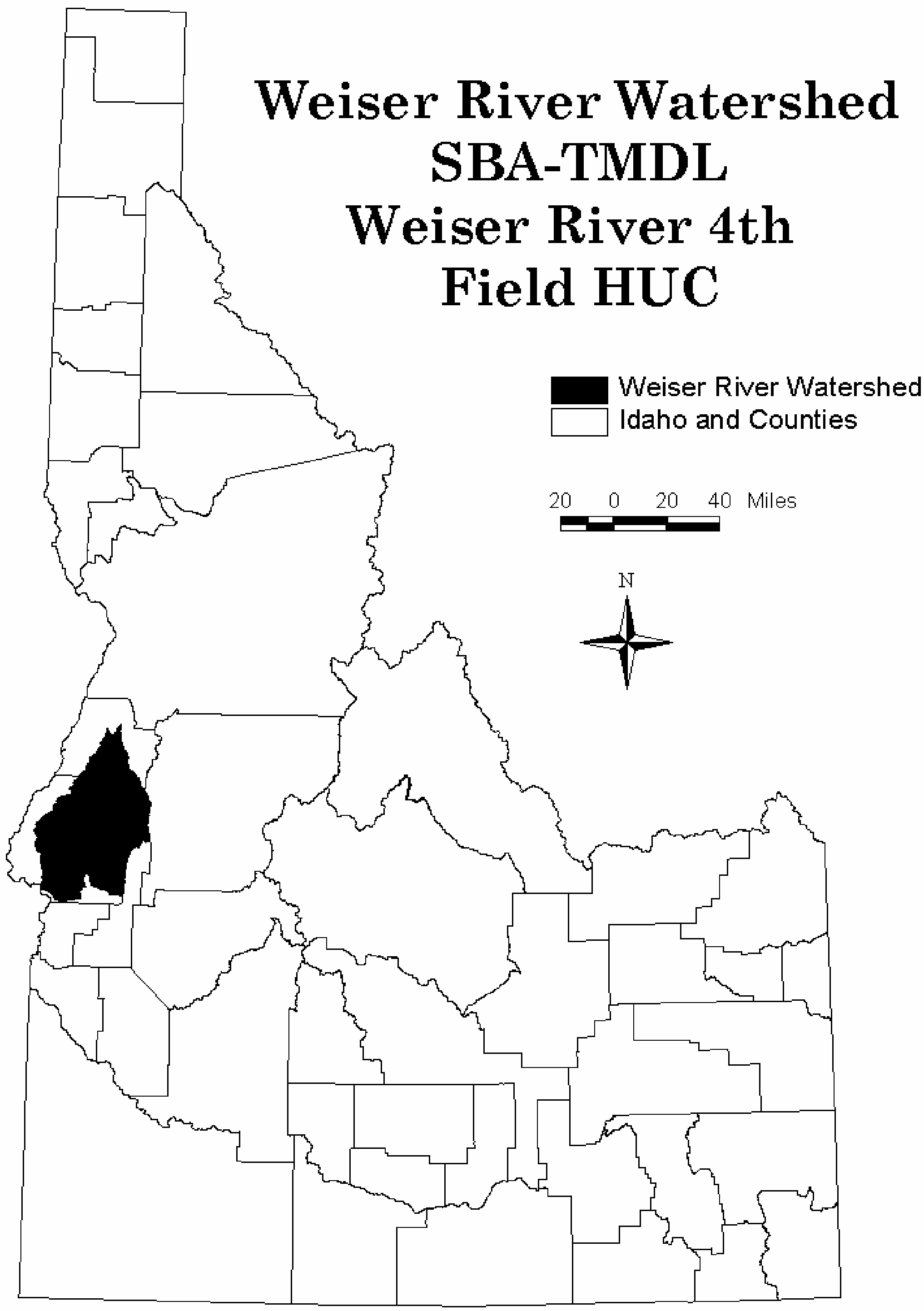


Figure 2. Weiser River Watershed.

Climate

There are three historic and current weather-monitoring stations in the Weiser River Watershed: at Cambridge, Weiser, and Council, Idaho (Western Regional Climate Center 2003). There are also four United States Department of Agriculture Natural Resources Conservation Service (NRCS) SNOTEL monitoring sites: Bear Saddle, Squaw Flat, Van Wyck, and West Branch (Natural Resources Conservation Service 2003). (More discussion of snow accumulation and snowmelt will follow in the hydrology section.)

The Weiser River Watershed ambient air temperature can vary, depending on seasonal variability and elevation. The maximum air temperature in the summer months can easily exceed 100 °F throughout the watershed, and the minimum winter ambient air temperature can dip well below zero during winter months. Table 1 shows the average temperatures and precipitation in the Weiser River Watershed, and Figure 3 shows expected average precipitation.

As with much of southwestern Idaho, the Weiser River Watershed is subject to wet and cool winters, when a majority of the precipitation events occur. Summer months are usually dry with occasional brief and sometimes heavy precipitation events. The upper elevations of the watershed can have considerable snow accumulation, with an expected permanent winter snow pack above 5,000 feet. However, it is not uncommon for substantial snow accumulation of a foot or more in lower elevations (below 5,000 feet), which may or may not be present throughout the entire winter.

Rains on snow events are a common occurrence in the lower elevations and usually occur in late December and January. It was one of these events, in December 1996 and January 1997, that caused extensive flooding throughout the watershed. Record discharge (31,000 cubic feet per second [cfs]) was recorded on the Weiser River at Weiser, Idaho, in early January 1997. Heavy snow accumulation was recorded in the lower elevations in December, followed by warmer ambient air temperatures and steady rains at the end of the month and the first of January. (More discussion on the hydrology of the Weiser River will follow in the hydrology section.)

Table 1. Climatic Summary. Available Weather Information (Western Regional Climatic Center 2003). Weiser River Watershed.

Climate Parameter	Weiser, Idaho Elevation: 2,110 feet Station Number: 109638	Cambridge, Idaho Elevation: 2,650 feet Station Number: 101408	Council, Idaho Elevation: 3,150 feet Station Number: 102187
Average Maximum Temperature (°C / °F)	17.9 / 64.3	16.9 / 62.4	16.1 / 61.9
Average Minimum Temperature (°C / °F)	2.3 / 36.1	0.8 / 33.5	1.6 / 35.0
Average Maximum Temperature (June-August) (°C / °F)	31.4 / 88.5	31.1 / 88.0	30.5 / 86.9
Average Minimum Temperature (December-February) (°C / °F)	-6.2 / 20.9	-8.7 / 16.4	-7.8 / 18.0
Average Annual Precipitation (inches)	11.7	20.1	24.7
Average Total Snowfall (inches)	18.4	51.8	48.2

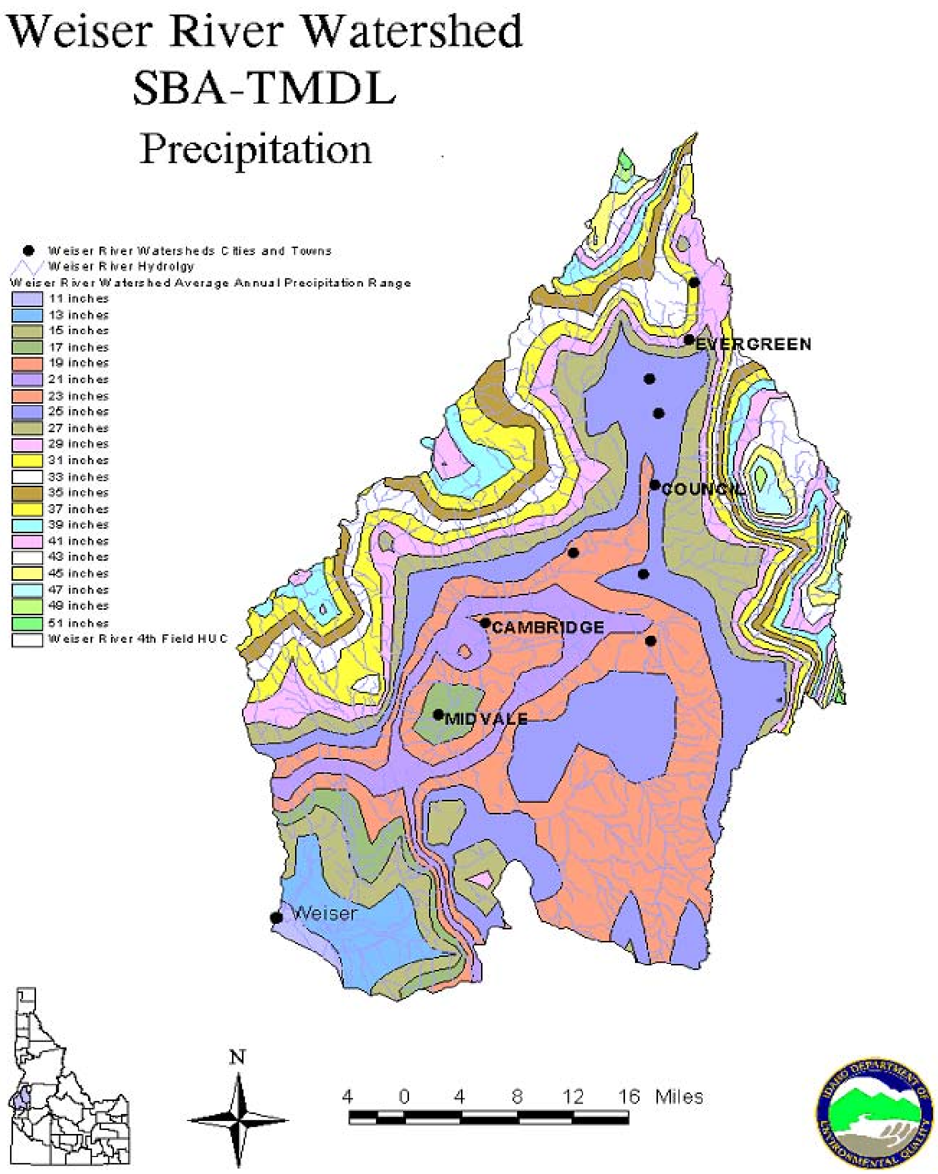


Figure 3. Precipitation Range. Weiser River Watershed.

Subbasin Characteristics

Hydrology

Most of the Weiser River would be classified as having unregulated flow. Only the Crane Creek and Mann Creek Watersheds have significantly sized structures that could provide enough storage to assist in controlling high spring discharges. Both Mann Creek and Crane Creek Reservoirs' water storage is primarily for irrigation water supply.

However, river diversions are located throughout the watershed. These diversions can be found in the Little Weiser River Watershed, the upper portion of the watershed on the main Weiser River and the West Fork Weiser River, and the lower portion of the watershed near the Weiser Cove area. The main diversion in the lower section is the Galloway Dam, which provides irrigation water for the Weiser Flat area through the Galloway Canal. Approximately 1 mile upstream, water is diverted to the Sunnyside Canal. There are other in-river diversions between the cities of Cambridge and Midvale, along with numerous in-river diversions on the Little Weiser River near Indian Valley.

The lower section of the Weiser River (Galloway Dam to the Snake River) could be classified as a Rosgen type F channel (Rosgen 1996). The confinement of the river in this channel type is associated with a series of dikes built for flood control. Even with these flood control dikes, out-of-bank events still occur, as happened in the 1997 flood event.

If the series of dikes were not present, the Weiser River is this area would probably be classified as a Rosgen type D channel. This type of channel is associated with braided channels and low gradient systems where high amounts of sediment from upstream sources would influence the natural channel morphology. This channel morphology is also noted in other areas where the valley type does not confine the channel. These areas are associated with the areas near the Midvale-Cambridge, Indian Valley, and Council portions of the watershed. Access to the historic floodplain is limited in these areas due to manmade confinement. While out-of-bank events do occur, they are not with the frequency of pre-historic conditions.

Other sections of the river can also be described as Rosgen type F channels, but confinement is more associated with valley slope rather than anthropogenic conditions. These are usually higher gradient systems than those segments associated with the other type F channels. Meandering, sinuosity, and lateral movement are limited by the confinement of the valley slope rather than the manmade dike system.

The watershed can be broken into two distinctive segments. As shown in Figure 4, the Weiser River becomes a fifth order stream at the confluence of Hornet Creek and the West Fork of the Weiser River. The Crane Creek drainage also constitutes a fifth order water body. With these classifications, the Weiser River becomes a sixth order water body from Crane Creek to the confluence with the Snake River.

Influence of Hydrology on Sediment

Floodplains of these D channel types (Galloway Dam to the Snake River) tend to store sediment in bank deposits and will be more stable as vegetation becomes established. High flow events are more likely to move sediment deposits from these channels where vegetation is sparse. The channel as it exists today tends to move sediment through to the Snake River because the old braided system is no longer in existence to potentially store sediment.

The primary mechanism of sediment transport in the Weiser River Watershed is surface water flow. High flows can transport large amounts of sediment in a wide range of particle sizes and weights. Lower flows preferentially transport lighter, smaller particle fractions. Sediment particles are deposited in areas of streams and rivers where flows decrease and sediments fall out proportionately with size and weight distributions. Sediments deposited in this manner accumulate in areas of the channel where flows are reduced. They can be re-suspended due to increasing flow and carried further downstream. Sparse vegetation and timing of snowmelt in areas of the Weiser River Watershed produce conditions favoring high surface runoff and sediment transport.

Additionally, land use patterns may influence sediment transport and delivery within the watershed:

- Flood and furrow irrigation ditches, if they are aligned and sloped toward streams and rivers, act to direct snowmelt runoff to surface water systems. In contrast, sediment basins and settling ponds or other treatment mechanisms on agricultural lands can help to contain snowmelt and stormwater runoff and reduce or remove suspended sediments from both agricultural flows and precipitation events.

- Similarly, a high density of impervious surface (commonly associated with urban development) increases the volume of runoff from storm events. If properly managed, this stormwater can be diverted to catchbasins or other mechanisms where velocity is decreased and entrained materials are allowed to settle out before water enters surface or ground water systems.

Unfortunately, the relative impact of land use practices is not quantifiable with the available data for the Weiser River TMDL.

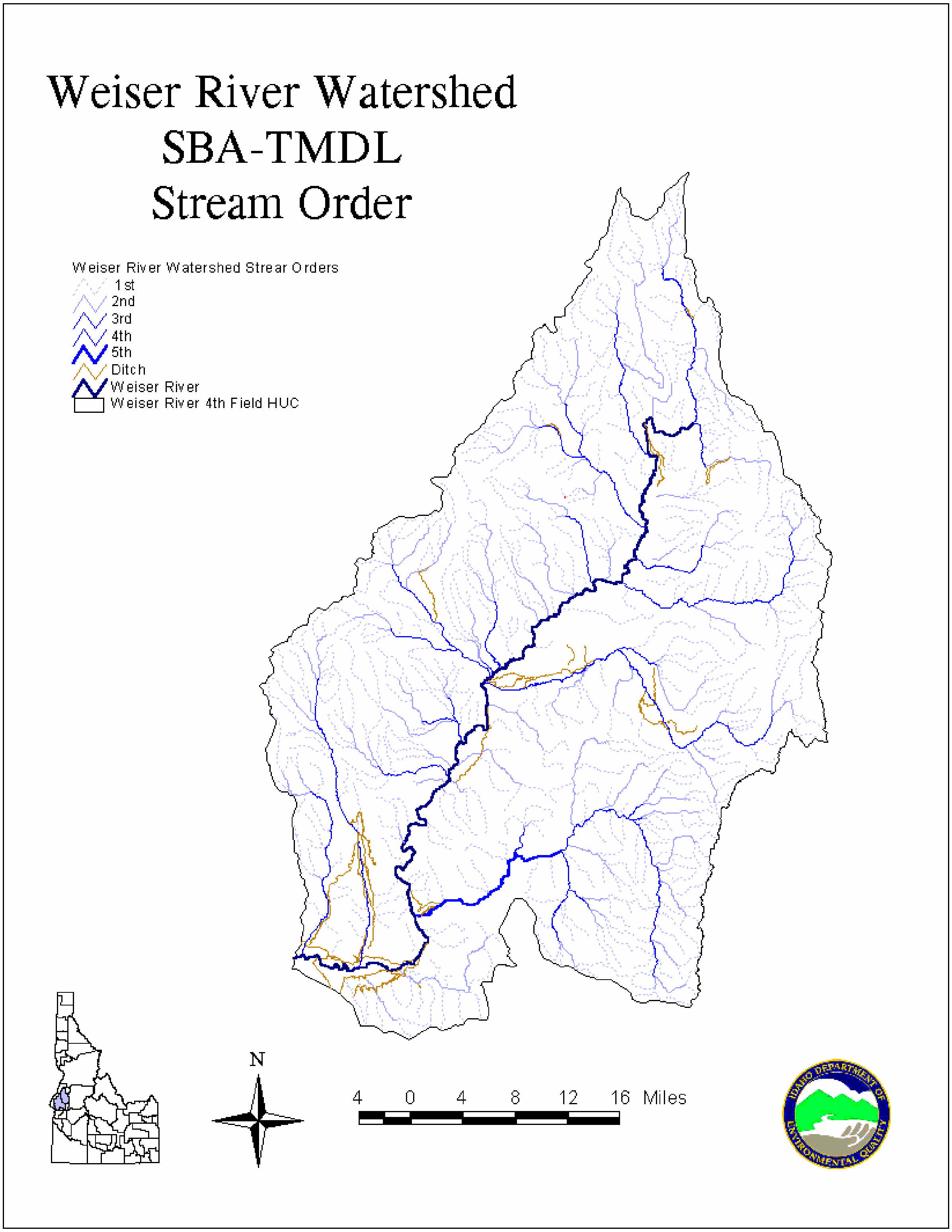
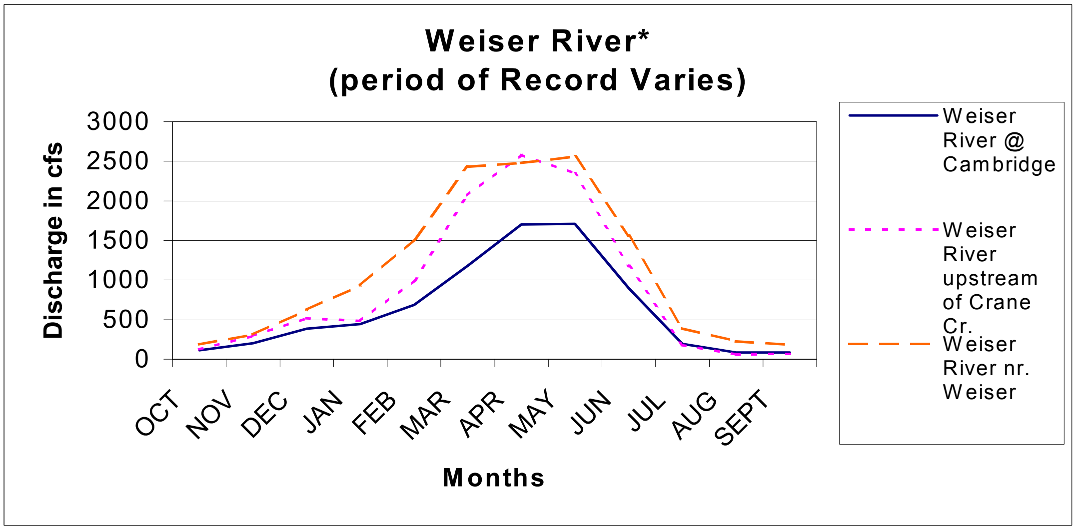


Figure 4. Overall Hydrology and Stream Order. Weiser River Watershed.

As shown in Figure 5, flows in the mid to late spring period usually account for a majority of discharge in the watershed. However, rain-on-snow events in mid-winter/early spring can result in large discharges during this period. Of course, this is dependent on climatic conditions that will vary from year to year. Figure 6 shows the discharge associated with Crane Creek Reservoir, which indicates that a majority of spring runoff is maintained in the reservoir for later season irrigation use.



** Period of Record, Weiser River at Cambridge 1939-2000, Weiser River above Crane Creek 1939-2003, Weiser River near Weiser 1890-1891, 1894-1896, 1897-1899, 1900-1904, 1910-1914, 1952-2003.*

Figure 5. Weiser River Historic Discharges, Three U.S. Geological Survey Gage Sites: No. 13258500, No. 13263500, and No. 13266000. Weiser River Watershed.

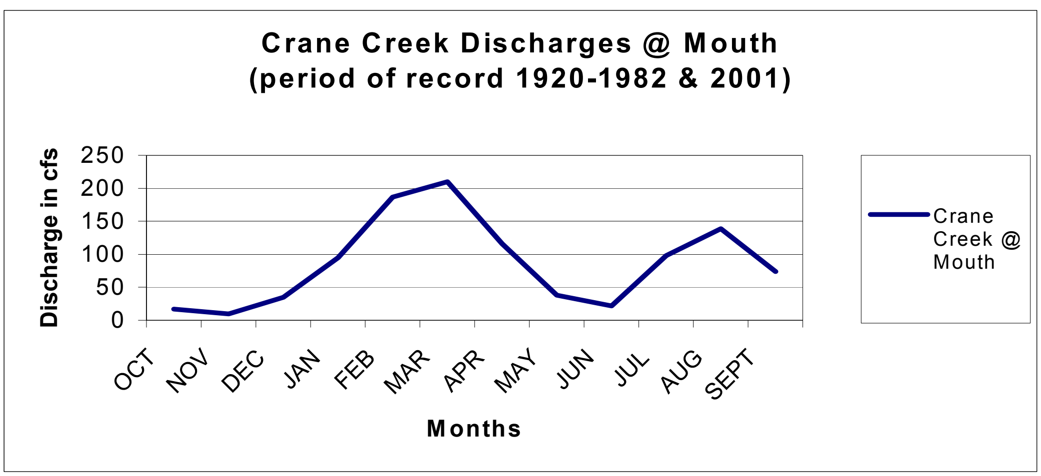


Figure 6. Weiser River Historic Discharges, Crane Creek at Mouth, Gage Site No. 13265500. Weiser River Watershed.

The Weiser River Watershed has numerous historic U.S. Geological Survey (USGS) discharge gage sites. Many of these sites have not been active since the 1920s, but the historic information does provide for adequate reference for a variety of watershed characteristics. This information demonstrates the intermittent flows encountered in the southern and lower elevation water bodies, while the northern and higher elevation water bodies generally demonstrate perennial flow conditions (waterdata.usgs.gov/id/nwis/monthly/) (USGS 2003*a*).

Many of the sites shown in Figure 7 provide information on irrigation water diversion throughout the watershed. Overall there are 38 historic and current gage sites in the watershed. Some monitor discharges in natural stream channels, while others monitor the amount of water diverted into manmade conveyances.

The constructed dams in the Weiser River Watershed were mainly developed for irrigation water storage. Figure 8 shows the major impoundments in the watershed that meet the criteria of 40 feet or higher~~.~~ , and Table 2 provides specific information on each structure.

As shown in Figure 6, Crane Creek Reservoir provides irrigation water storage to be used later in the irrigation season, when Weiser River flows become low and unpredictable. Water is released from the reservoir in mid-summer, and then allowed to flow down the natural channel and enter the Weiser River. The river is partially diverted further downstream at Galloway Dam into the Galloway Canal and the Sunnyside Canal. Crane Creek Dam may provide some early spring flood control due to its low elevation~~.~~ , but, its primary purpose is irrigation water storage.

Mann Creek Dam provides water storage for irrigation use in the Mann Creek Watershed. Most irrigation water is diverted from the natural channel, with the dam used mainly for water storage rather than diversion. Some irrigation water is actually diverted into the Monroe Creek Watershed, located to the west of the Mann Creek Watershed.

Table 2. Dams, Year Constructed, Water Body, Ownership, Owner, and Size. Weiser River Watershed.

Dam Name	Year Constructed	Impounded Water Body	Ownership	Owner	Size of Impoundment (acres)
C Ben Ross	1937	Little Weiser River	Private	Little Weiser River Irrigation District	353
Crane Creek	1912	Crane Creek	Private	Crane Creek Reservoir Adm. Board	3,000
Fairchild	1975	Sage Creek	Private	Private Individual	104
Mann Creek	1967	Mann Creek	Federal	Bureau of Reclamation	315

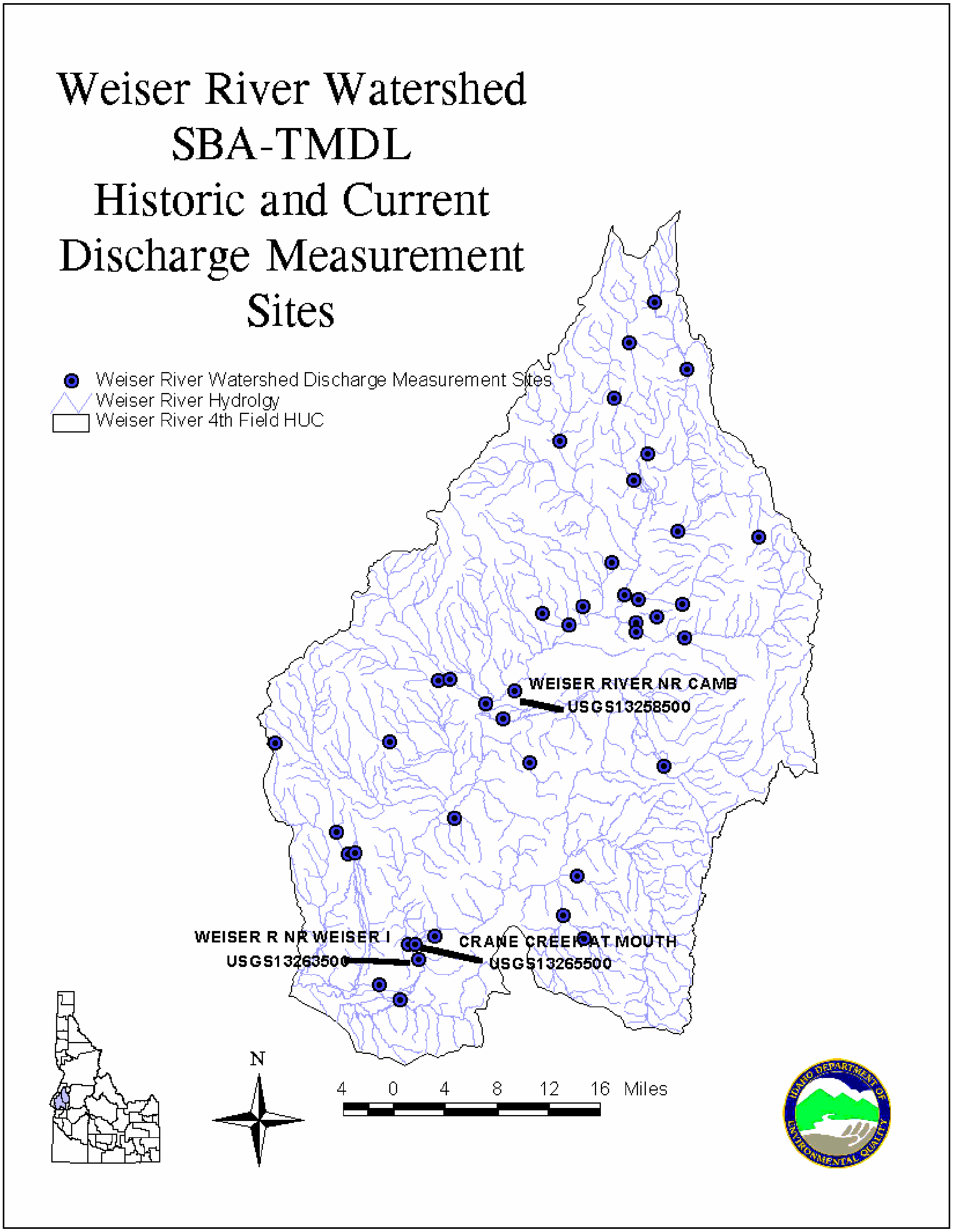


Figure 7. Current and Historic Gage Sites. Weiser River Watershed.

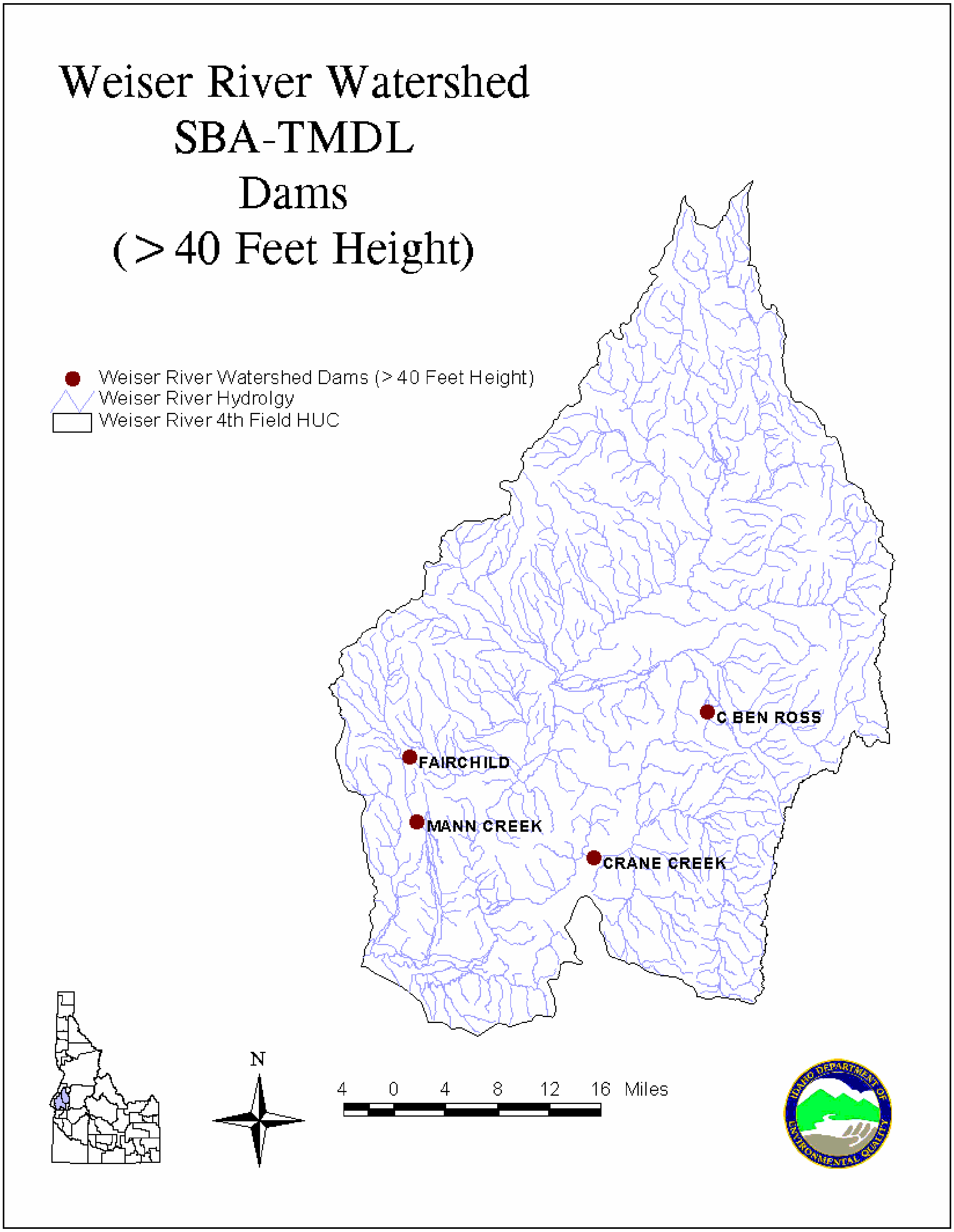


Figure 8. Dams. Weiser River Watershed.

Geology

The geology (Figure 9) of the Weiser River Subbasin is dominated by basalts of the Columbia River Basalt Group. Miocene (23.7 to 5.3 million years ago) basalt flows dominated by the Grande Ronde basalt formation occupy the northern half of the subbasin. Miocene plateau basalt dominated by the Weiser basalt formation is found in the southern half of the subbasin. Together these flows constitute a feature known as the Weiser embayment, which is a part of the southernmost lobe of the Columbia Plateau.

Pieces of pre-Columbia River basalt terrain occur at the margins of the subbasin. A mixture of Mesozoic (older than 66 million years) intrusives, volcanic rocks, and metabasalts occur on the western boundary of the subbasin forming Cuddy Mountain and Sturgill Peak. On the eastern side of the subbasin, at Council Mountain, a region of Cretaceous (144 to 66 million years ago) granitic intrusive rocks stick out above the lava formations.

Valleys in the central and southern portions of the subbasin are filled with Quaternary (1.6 million years ago to present) alluvium and older Miocene stream and lake deposits. The very southernmost tip of the subbasin on the south side of the Weiser River contains Pliocene stream and lake deposits presumably from lakes formed as lava blocked the normal path of water (Alt and Hyndman 1989).

Major Geologic and Geomorphic Features

The Columbia River Basalt Groups of the Columbia Plateau form three embayments into western Idaho (Fitzgerald 1982). The southernmost embayment, occupying the Weiser River Subbasin, is known as the Weiser embayment. The Weiser embayment is bounded on the east by the Salmon River Mountains, on the west by the Snake River canyon, on the north by the Seven Devil Mountains, and on the south by the Snake River Plain. The embayment occupies some 7,500 square kilometers (km^2), is about 130 km north to south, and is 75 km wide at the interface with the Snake River Plain. Elevations range from less than 3,000 feet up to about 7,000 feet.

The Weiser River system bisects the interior of the embayment, exposing deep youthful canyons in the Crane Creek drainage, north of Council and south of Cambridge. In some places the water has cut over 800 feet through basalt. The Snake River and its tributaries on the west side of the embayment (west of the Weiser River Subbasin) and the Payette River on the east side have cut even farther to the sub-basalt rock.

Geologic Descriptions and History

The oldest rocks exposed in the subbasin consist of Triassic to Cretaceous metavolcanic, metasedimentary, and intrusive formations underlying steptoes (island-like high areas) and ancestral highlands along the western and eastern edges of the subbasin. These rocks are visible in deep eroded canyons.

The rocks on the western edge of the subbasin were formed primarily from oceanic crust and consist of metabasalts, submarine volcaniclastics, and associated marine detrital rocks. These rocks are exposed in the Seven Devil Mountains, Cuddy Mountain, Sturgill Peak, and Peck Mountain.

On the eastern side of the subbasin, the West Mountains and Council Mountain are of continental origin and consist of metamorphosed granitic intrusive rocks associated with the Idaho batholith.

Columbia Plateau eruptions occurred 17 to 14 million years ago. Within the Weiser embayment, basalts of the Imnaha Basalt Formation were formed first, followed by basalts of the Grande Ronde Basalt Formation. The Imnaha Basalt formed the majority of the Weiser embayment outline, with lava up to 700 meters thick. The Grande Ronde flows were more limited in extent and were about 150 to 300 meters thick. Between eruptive episodes of both the Imnaha and Grande Ronde Formations were periods of sediment deposition that were covered over by the next lava flow forming interbeds of the “lower” Payette Formation.

Down warping of the Grande Ronde Basalt occurred especially at the southern end of the embayment causing local volcanism known as the Weiser volcanic episode. Up to 350 meters of Weiser Basalt accumulated in localized flow-on-flow sequences. Sediment and ash accumulations occurred simultaneously, producing the “upper” Payette Formation interbeds. These features are located generally within the Miocene plateau basalt flows of western Idaho on Figure 9.

After the Miocene eruptions, the basement rocks underwent uplifting into a series of fault blocks. Sediments continued to accumulate, especially in the down-warped areas of the central and southern portion of the embayment. At the same time, the Snake River was forming its new path south of the embayment and west of the Seven Devils steptoes. Sediments accumulated along the southern margin of the Weiser embayment from ancient lakes, known as the Idaho Formation sediments. These lakes were Snake River backwaters that helped the erosion process occur through Hells Canyon.

The fault block basin and range type activity that was occurring regionally under the embayment resulted in the Long Valley fault system, the Paddock Valley fault system, and the Snake River fault system to the northwest. There was continued down-warping of the central Indian Valley trough, a synclinal depression, and up-warping of the Seven Devils. There was weak anticlinal-synclinal folding parallel to the Paddock Valley fault system, which is more pronounced southwest of Cuddy Mountain through the Sturgill Peak area to Dead Indian Ridge.

Fitzgerald (1982 p125-126) describes the present-day features as follows:

> *Structural growth of present-day features continued following the eruption of the Weiser Basalt. A new cycle of stream development began as basins and uplands became more pronounced. Continued movement of the Paddock Valley fault*

system left the Weiser River in an antecedent position across structural features, such as the Cambridge fault, while its tributaries developed in consequent and subsequent positions, as in the up-dip Pine Creek graben. Crane Creek, developing primarily in post-Weiser Basalt time from runoff gathered in the Indian Valley trough, became incised across the developing step-fault blocks of the Paddock Valley fault system. Weiser Basalt units near Mann Creek Reservoir were slightly uplifted as the Sturgill Peak block and anticline continued to rise. This is indicated by the incision of the Weiser River course across the Sturgill Peak anticline and adjacent Weiser Basalt units southeast of Shoe Peg Valley.

Development of the present day topography and structures formed primarily by continued movement of the major faults, by the development of subsequent streams along fault zones, and by the development of consequent streams on dip-slopes and depressions. A thick accumulation of Idaho Formation sediments was deposited along the southern margin of the embayment and similar sediment partially filled fault-block troughs of the Long Valley fault system. The basement-derived arkosic composition of the these sediments suggests that the drainage system and structural controls at the eastern margin of the embayment were well developed by the Pliocene (5.3 to 1.6 million years ago), so that most post-Miocene structural activity was a continuation of an already established pattern.

Soils

Soil groups for the Weiser River Subbasin are shown on Figure 10. Individual soil units are further described in Table 3. In the higher elevations (4,000 to 6,000 feet) along the northwest and northeast margins of the subbasin, where low order headwater streams are located, soils are of the Bluebell-Ticanot-Demast group (Figure 10). These soils vary from shallow to very deep, are well drained, and have moderate to slow permeability (Table 3). Slopes vary considerably from 5% to 65% and, thus, runoff varies from medium in speed to very rapid. The slopes have a moderate to very severe erosion hazard. Bluebell soils are very cobbly loams over basalt and support predominantly ponderosa pine woodland vegetation. Ticanot very cobbly loam inclusions tend to form on open mountain sagebrush rangelands on shallow soils over basalt. Demast loam soils are on the steep mountainsides supporting mixed fir and pine vegetation.

Further down the drainage on lower elevation (3,500 to 5,000 feet) rangelands the Riggins-Meland-Klicker soil group predominates. These soils are very stony on rolling and undulating hills. They are moderate to shallow in depth over basalt. Riggins soils occur on steep, south facing slopes (up to 75% incline) that have very rapid runoff and a very severe erosion hazard. Vegetation on these soils is big sagebrush/Idaho fescue or big sagebrush/bluebunch wheatgrass rangelands. Meland soils are not quite as steep and support bitterbrush/Idaho fescue rangelands. Klicker soils are found under the woodland canopies of Douglas fir and ponderosa pine on steep slopes.

The lower elevation (2,200 to 3,500 feet) valley soils of the upper half of the subbasin north of Cambridge are largely of the Shoepeg-Catherine-Dagor soil group. These soils are very deep and somewhat poorly drained. These loam to silt loam soils lie on areas with very low slope and have slow runoff and only slight erosion. They are used primarily for croplands; the Dagor soils are also used for hay and pastureland.

The southern half of the subbasin is dominated by the Gem-Reywat-Bakeoven group over basalts. Gem soils are extremely stony to stony clay loams on a variety of slopes (up to 60%). They are moderately deep, well drained soils, but with slow permeability. Runoff can be rapid and the erosion hazard can be severe on steeper slopes. They typically support big sagebrush/bluebunch wheatgrass rangelands. Gem soils form complexes with Reywat and Bakeoven soils. Gem-Reywat complex soils tend to be shallow and very stony to very gravelly loams and clay loams. Gem-Bakeoven complexes are very shallow and the vegetation gives way to stiff sagebrush/Sandberg bluegrass rangelands.

Occupying the central portion of the subbasin below Cambridge on Miocene stream and lake deposits are the Brownlee-Deshler-Deterson and Newell-Langrell-Onyx groups. Brownlee soils are deep, sandy loams on a variety of slopes up to 35%. Unlike the Shoepeg group to the north, Brownlee soils have a moderate amount of available soil water and, thus, support primary hay and pastureland. Deshler soils are moderately deep silty clay loams on volcanic tuff or siltstone. There are a variety of slope types (up to 60%) that support hay/pastureland and rangelands at higher slopes. Deterson silt loams are deep soils on steep (30 – 60%) slopes supporting big sagebrush/bluebunch wheatgrass rangelands.

Newell-Langrell-Onyx soils are deep, loamy soils on lower slopes. Newell clay loams (up to 8% slope) tend to support croplands, while the stony clay loams (up to 12%) form mostly rangelands. Flat Langrell soils are loams and gravelly loams that support ponderosa pine woodlands, hay/pasturelands, and wild rye/bluebunch wheatgrass communities. Onyx silt loams (0 – 3% slopes) are used for croplands.

Miocene and Quaternary lake deposits and alluvium in the southernmost portion of the subbasin include a variety of soil groups (Agerdelly-Glasgow-Deshler, Lololita-Lanktree-Payette, Greenleaf-Bissell-Nyssaton, and Baldock-Moulton-Falk). Agerdelly-Glasgow-Deshler soils occur on ridges and bluffs in the lower Crane Creek, Mann Creek, and Monroe Creek areas. Agerdelly is a deep clay soil on big sagebrush/bluebunch wheatgrass rangeland slopes up to 60%. Glasgow soils are clay loams on volcanic tuff, with similar depth and slopes as Agerdelly soils. Glasgow soils may support croplands and hay/pastureland in addition to rangelands. Deshler soils described earlier are silty clay loams on volcanic tuff.

Lololita-Lanktree-Payette soils occupy the bluff between lower Mann Creek and the Weiser River. Lololita soils are deep sandy loams on slopes up to 30%. Lower slopes are used for cropland and hay/pastureland, while upper slopes are rangelands. Lanktree soils include loams, clay loams, and very cobbly loams on lower slopes (to 30%). These soils are deep and can be used for cropland or rangeland depending on slope. Payette soils are coarse sandy loams up to 60% and are largely big sagebrush/bluebunch wheatgrass rangelands.

The Greenleaf-Bissell-Nyssaton group occurs at the mouths of Mann and Monroe Creeks and in spring fed areas on the south side of the lower Weiser River. These soils as a group are generally deep silt loams and clay loams on flats and low slopes used for cropland. Greenleaf silt loams are on lands up to 12% slope and are used for hay/pastureland at these higher slopes.

Baldock-Moulton-Falk soils occur in the lower Weiser River valley from the city of Weiser to the point where the river drains from the north. All of the soils in this group are deep, but poorly drained, and used for cropland. Baldock soils are silt loams and clay loams, whereas the other two are fine sandy loams.

The southernmost tip of the subbasin consists of Pliocene lake deposits of the Idaho Formation which form soils of the Haw-Payette-Van Dusen group. Haw silt loams are very deep soils on a variety of slopes up to 60% that are used for rangelands and dryland farming. Payette coarse sandy loam soils were described previously. Van Dusen soils are deep loams that occur in association with Payette soils on steep slopes or as complexes with Haw soils.

Cretaceous granitic intrusive rock or plutons in the Council Mountain area produce soils of two Bryan groups. Bryan soils are coarse sandy loams on forested steep slopes (40% – 60%). Grand fir and Douglas fir typically dominate these areas.

Soil K Factors

A soil's erodability, or K factor, represents both the susceptibility of soil to erosion and the rate of runoff, as measured under standard conditions. Soils high in clay have low K values (0.05 to 0.15) because they resist detachment. Coarse textured soils, such as sandy soils, have low K values (0.05 to 0.2) because of high permeability and low runoff, even though these soils are easily detached. Medium textured soils, such as the silt loam soils, have moderate K values (0.25 to 0.4) because they are moderately susceptible to detachment and they produce moderate runoff. Soils having a high silt content are the most erodable of all soils. They are easily detached and tend to crust, producing high rates of runoff. Values of K for these soils tend to be greater than 0.4.

When viewing a soil's potential to experience overland erosion, one should take into account steepness, as represented by rapid runoff and severe erosion hazard rankings and the soil's K factor (Table 3). Critically important soils from an overland erosion perspective are those that are steep and have moderately high K factors (>0.3). In the Weiser Subbasin, Meland, Gem, Brownlee, Deterson, Payette, Haw, and some Lanktree soils are at greatest risk. Also, valley bottom soils with high K factors (>0.4) are at risk of erosion from bank sloughing and excessive irrigation application. These soils include Onyx, Greenleaf, Haw, and Nyssaton.

Table 3. Soil Unit Characteristics. Weiser River Watershed.

Soil Unit	Elevation (ft)	Precipt (in.)	Air Temp (°F	Growing Season (days)	Depth	Drainage	Permeability	Available Water	Runoff	Erosion Hazard	Surface Erosion K Factor
Bluebell	4100 - 6100	22 to 26	39 - 42	65 - 75	mod. (24")	well drained	mod. slow	very low	med. to very rapid	mod. to very severe	0.2
Ticanot	3800 - 6000	22 to 26	38 - 42	65 - 75	shallow (15")	well drained	slow	very low	med. to rapid	mod. to very severe	0.17
Demast	4000 - 5500	22 to 25	33 - 40	70 - 80	very deep (60")	well drained	moderate	moderate	med. to very rapid	mod. to very severe	0.24
Riggins	3500 - 5000	18 to 22	45 - 47	110 - 130	shallow (19")	well drained	mod. slow	very low	med. to very rapid	slight to very severe	0.1
Meland	3200 - 5000	18 to 22	47 - 49	110 - 130	mod. (34")	well drained	mod. slow	low	med. to rapid	mod. to severe	0.2 to 0.37
Klicker	3500 - 5000	26 to 30	43 - 45	110 - 120	mod. (34")	well drained	slow	low	very rapid	severe	0.24
Shoepeg	2200 - 3500	14 to 18	50 - 54	130 - 150	very deep (60")	somewhat poorly	moderate	high	slow	slight	0.28 to 0.32
Catherine	2500 - 3500	18 to 22	48 - 52	130 - 140	very deep (60")	somewhat poorly	moderate	high	slow	slight	0.28
Dagor	2500 - 3000	17 to 19	45 - 47	120 - 130	very deep (60")	well drained	moderate	high	slow	slight	0.28
Gem	3000 - 4800	12 to 16	45 - 50	130 - 140	mod. (29")	well drained	slow	low	med. to rapid	mod. to severe	0.15 to 0.32
Reywat	3000 - 4800	12 to 14	45 - 49	130 - 140	shallow (19")	well drained	mod. slow	very low	med. to rapid	mod. to severe	0.15
Bakeoven	3000 - 4800	12 to 16	46 - 50	130 - 140	very shallow (9")	well drained	mod. slow	very low	med. to rapid	mod. to severe	0.1
Brownlee	2700 - 4000	15 to 17	45 - 47	110 - 120	very deep (60")	well drained	mod. slow	moderate	med. to rapid	slight to severe	0.37
Deshler	2500 - 4500	13 to 16	45 - 47	130 - 140	mod. (30")	well drained	slow	low	med. to very rapid	slight to very severe	0.1 to 0.24
Deterson	2500 - 4500	12 to 16	46 - 50	135 - 150	very deep (60")	well drained	slow	high	very rapid	very severe	0.32
Newell	2200 - 3400	12 to 16	47 - 51	110 - 130	very deep (60")	well drained	mod. slow	high	slow to medium	slight	0.32 to 0.37
Langrell	3000 - 3500	18 to 22	47 - 51	110 - 140	very deep (60")	well drained	moderate	low	very slow	slight	0.17 to 0.2
Onyx	3100 - 3200	14 to 16	48 - 52	135 - 145	very deep (60")	well drained	moderate	high	very slow	slight	0.43
Ager	2300 - 3000	12 to 14	50 - 52	135 - 145	very deep (60")	well drained	slow	high	med. to very rapid	mod. to severe	0.24
Glasgow	2300 - 3000	10 to 14	48 - 52	135 - 145	mod. (38")	well drained	slow	moderate	slow to very rapid	slight to very severe	0.28
Deshler	see above										
Lolalita	2300 - 3000	10 to 12	48 - 52	145 - 155	very deep (60")	somewhat excessive	mod. rapid	moderate	med. to rapid	slight to severe	0.17
Lanktree	2200 - 3500	10 to 12	49 - 52	140 - 150	very deep (60")	well drained	slow	mod. to high	slow to rapid	slight to severe	0.17 to 0.43
Payette	2300 - 3000	12 to 13	48 - 51	140 - 150	very deep (60")	well drained	mod. rapid	low	med. to very rapid	mod. to very severe	0.32
Greenleaf	2100 - 2400	10 to 12	49 - 52	150 - 155	very deep (60")	well drained	mod. slow	high	slow to medium	slight to moderate	0.49
Bissell	2100 - 2500	10 to 13	48 - 52	150 - 155	very deep (60")	well drained	mod. slow	high	slow	slight	0.28
Nyssaton	2100 - 2400	10 to 12	50 - 52	150 - 155	very deep (60")	well drained	slow	high	very slow	slight	0.49
Baldock	2100 - 2300	10 to 12	48 - 52	150 - 155	very deep (60")	poorly drained	moderate	high	slow	slight	0.32 to 0.37
Moulton	2100 - 2300	10 to 12	48 - 52	150 - 155	very deep (60")	poorly drained	mod. to mod. rapid	moderate	slow	slight	0.24 to 0.37
Falk	2100 - 2300	11 to 13	49 - 51	150 - 155	very deep (60")	somewhat poorly	mod. rapid	moderate	very slow	slight	0.2
Haw	2300 - 2700	12 to 13	47 - 51	145 - 155	very deep (60")	well drained	mod. slow	moderate	med. to very rapid	slight to very severe	0.43
Payette	2300 - 3000	12 to 13	48 - 51	140 - 150	very deep (60")	well drained	mod. rapid	low	med. to very rapid	mod. to very severe	0.32
Van Dusen	2400 - 3000	12 to 14	48 - 51	130 -140	very deep (60")	well drained	mod. slow	high	very rapid	very severe	0.24
Bryan	4200 - 6000	25 to 35	36 - 42	30 - 80	very deep (60")	excessively drained	rapid	low	very rapid	very severe	0.17

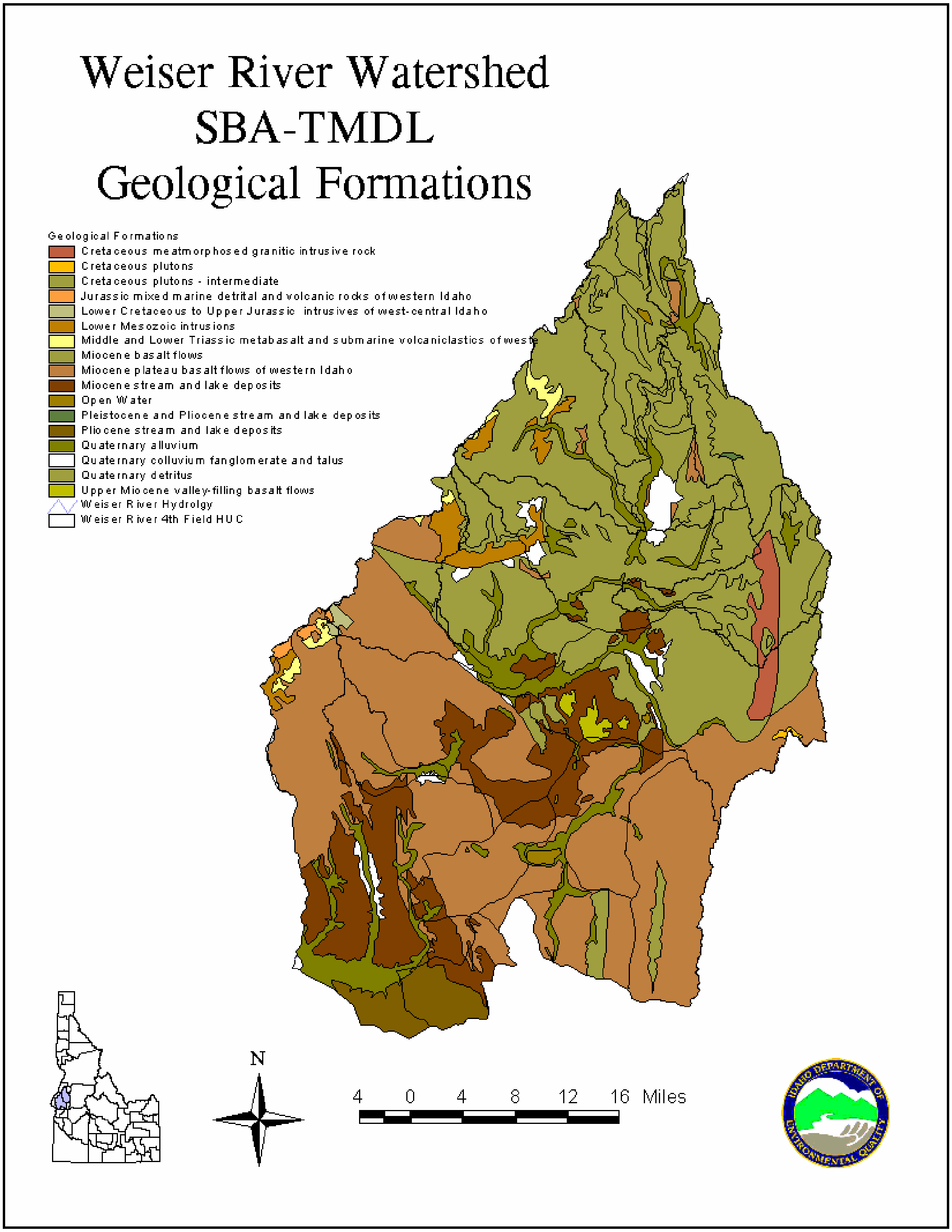


Figure 9. Geology. Weiser River Watershed.

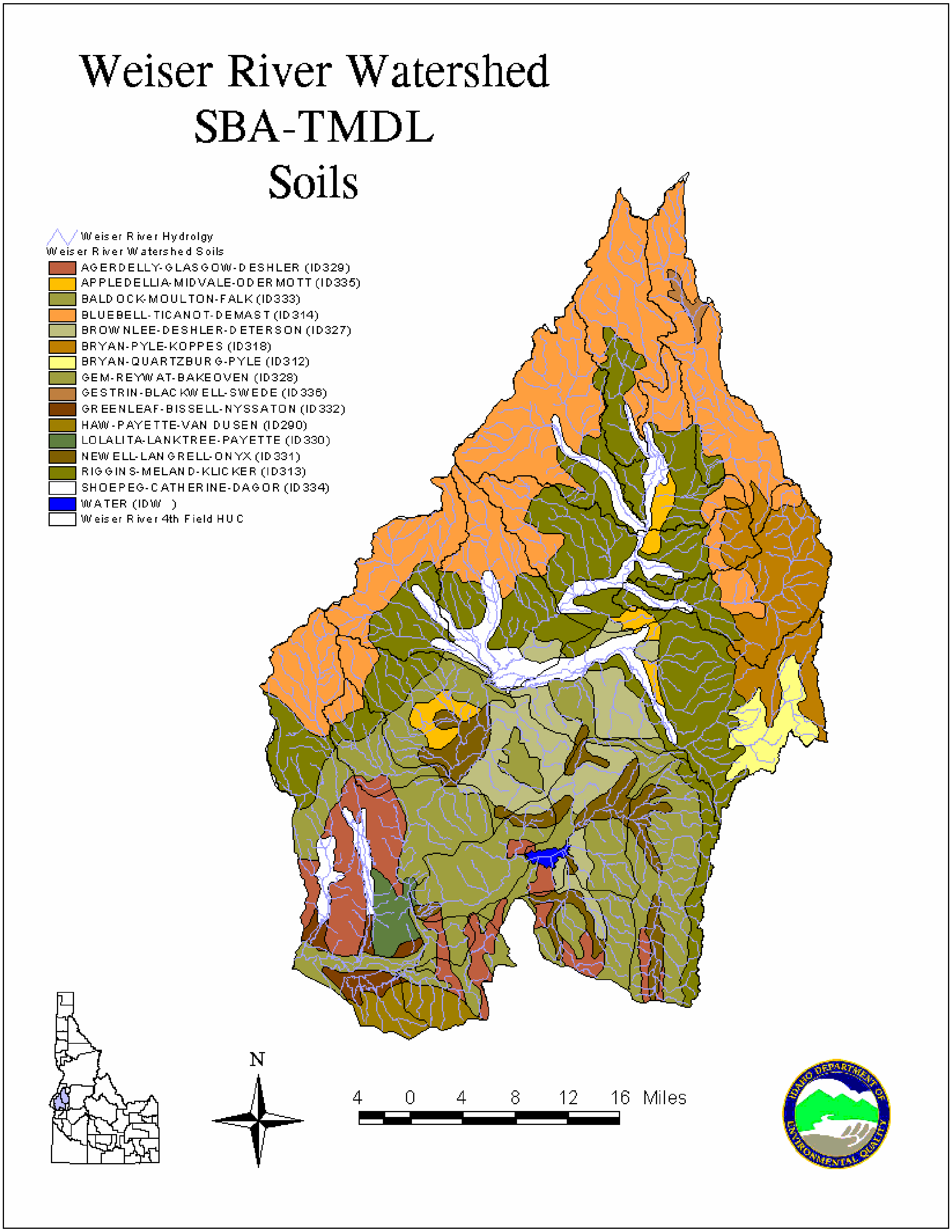


Figure 10. Soils. Weiser River Watershed.

Topography

Topography varies greatly throughout the Weiser River Watershed. The watershed is bounded by high elevation, forested mountains to the west, east, and north. The highest elevations are at No Business Mountain and Council Mountain in the West Mountain Range to the east, Cuddy Mountain and Sturgel Peak to the west, and the southern end of the Seven Devil Mountains to the north. The elevation changes from a low elevation of 604 meters (2,115 feet) near the confluence of the Weiser River and the Snake River near Weiser, Idaho, to a high elevation of 2,471 meters (8,459 feet) at Council Mountain. The changes in elevation are represented in Figure 11.

The higher elevation locations on the eastern side of the watershed are steeply sloped (between 30% and 50% slope), while the lower elevations are much flatter (between 0% and 10% slope). The steeper slopes are usually dominated by bare rock or sub-alpine ecosystems. Moderately sloped areas in the higher elevations are dominated by a mixture of pines and firs, with vegetation type usually dependent on slope aspect. Lower elevations, below the permanent winter snow pack, are usually grass and shrublands. Figure 12 shows the elevation contours in the Weiser River Watershed. Figure 13 shows the slopes.

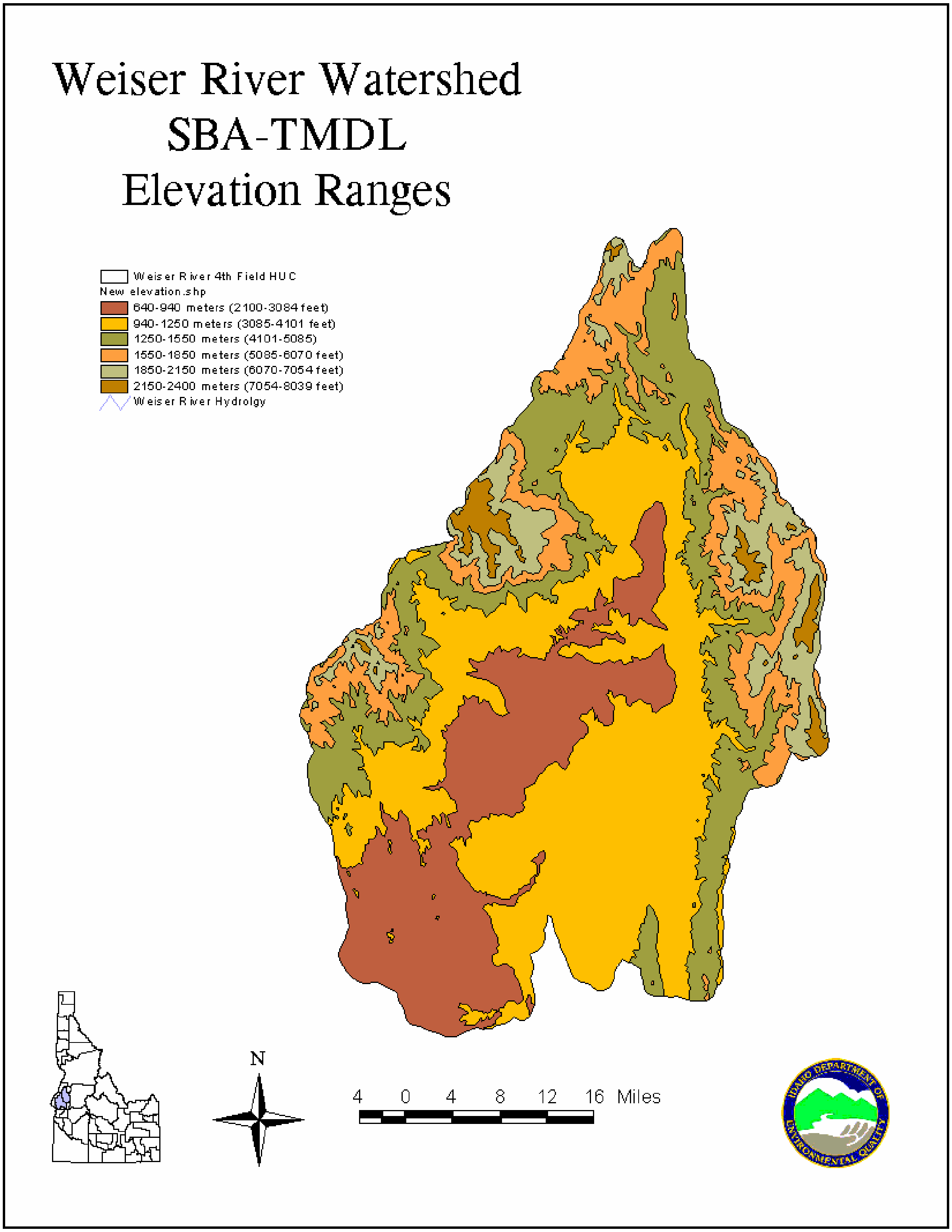


Figure 11. Elevations. Weiser River Watershed.

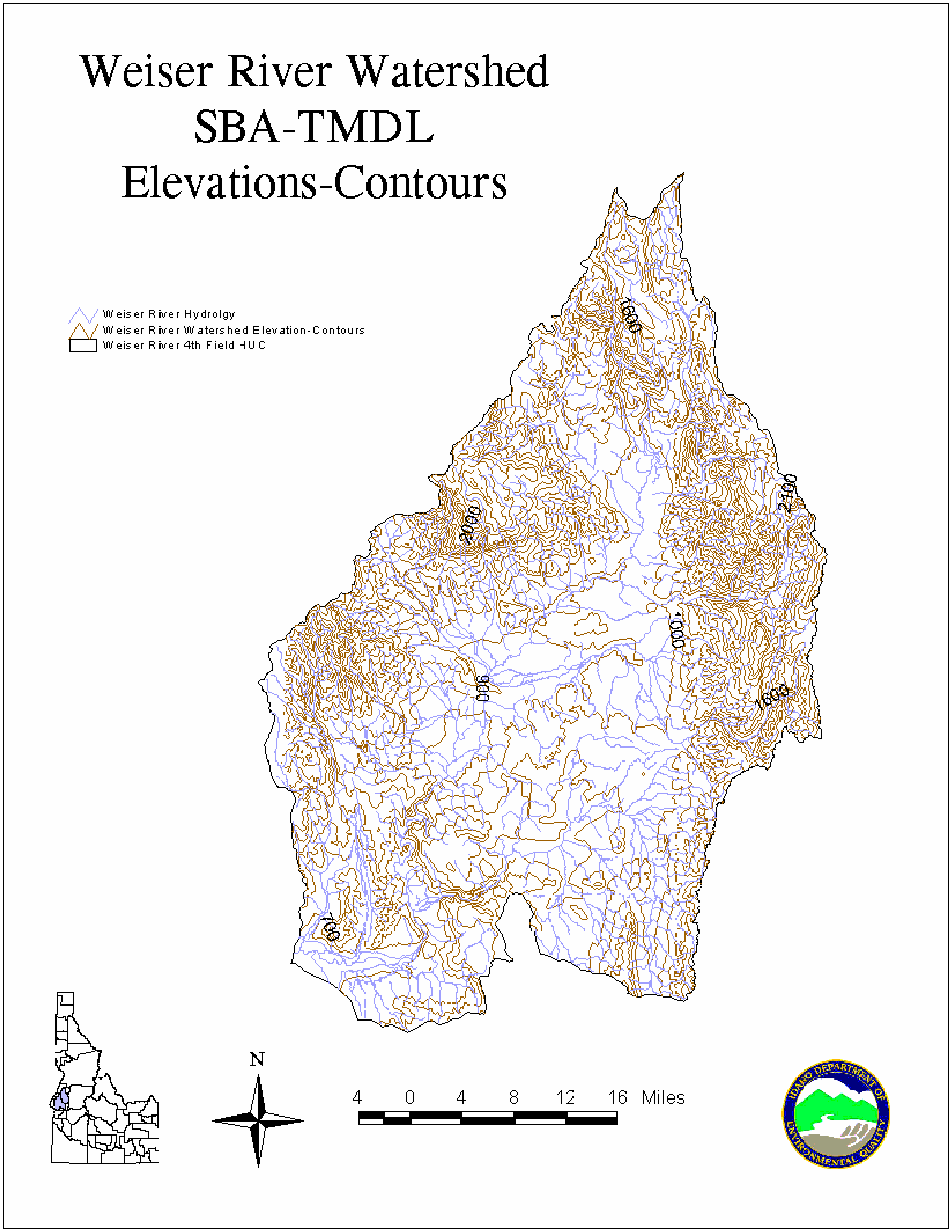


Figure 12. Contours and Elevations in Meters. Weiser River Watershed.

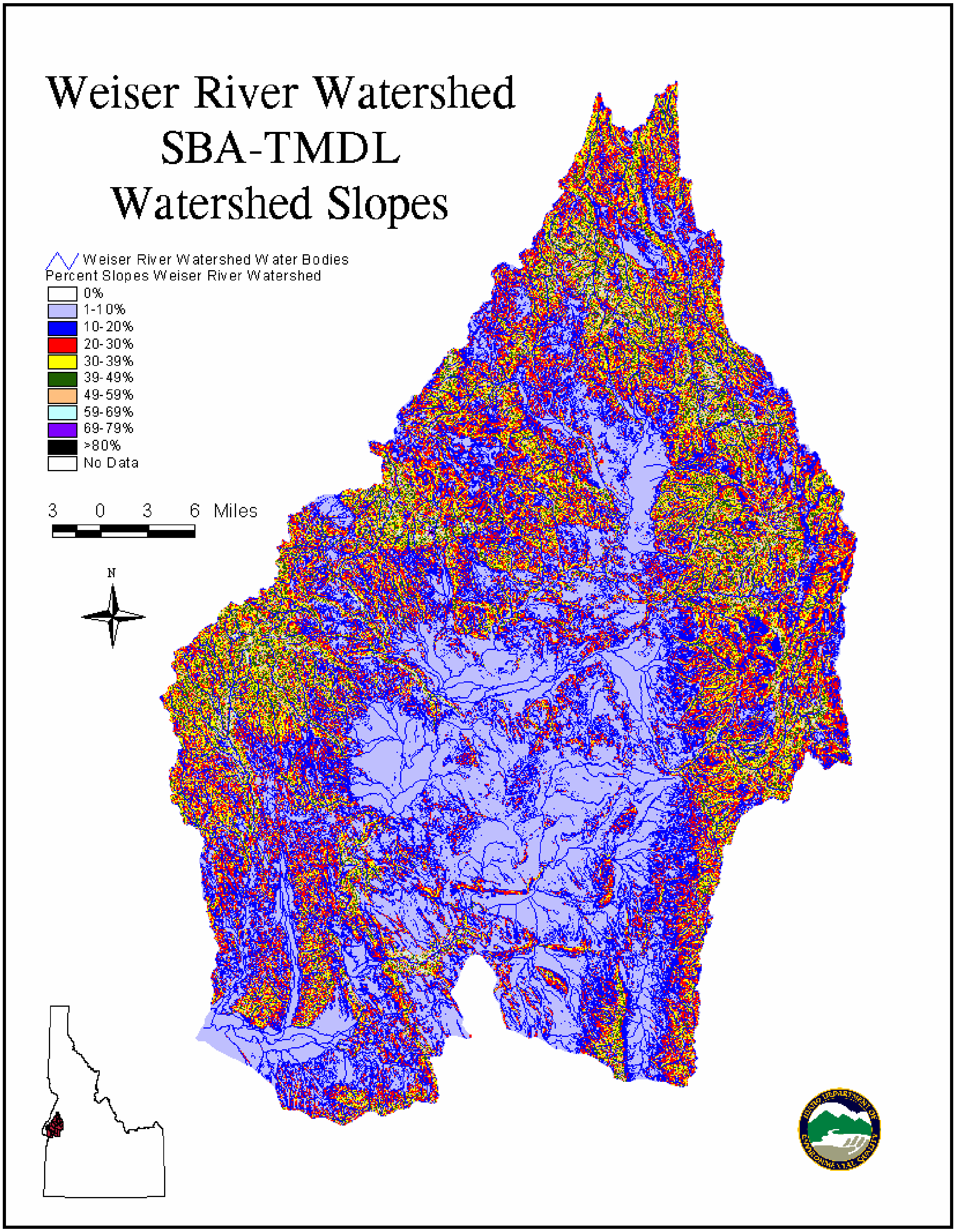


Figure 13. Slopes. Weiser River Watershed. (DEM Generated Map, Scale Different from Other GIS Generated Maps)

Vegetation

Vegetation varies as the elevation changes in the Weiser River Watershed. Lower elevation uplands that have not been brought into domestic cultivation are primarily sagebrush/steppe vegetation. Disturbance by fire or other natural activities may have altered the vegetation in some areas by allowing invasive plant species, such as cheatgrass (*Bromus tectorum*), to become established. Other areas may have been altered to enhance rangeland and potential feed production for livestock.

River floodplain vegetation can also vary with elevation and anthropogenic changes. In areas where river channels have been modified, the native vegetation may have been replaced or altered. In areas where the water's access to the historic floodplain has been limited, the native cottonwood species (*Populus* sp.) have been replaced with cultivated agricultural or more hydrophobic species. Areas that are still flood prone, however, still show the presence of native cottonwood or deciduous forest communities. For example, a stand of cottonwoods is located downstream of the confluence of the Little Weiser River and the Weiser River near Cambridge, Idaho. This is an area where the river water has access to the historic floodplain. Cottonwoods can also be found in thin bands along the river where high flows still have an opportunity to provide enough "free" water to maintain hydrophilic species.

Willow (*Salix* sp.) species can also be found in these areas where hydrophilic species can still exist. Grasses may also consist of a mixture of hydrophilic and hydrophobic species, depending on soil moisture content. Grass species may include, but are not limited to, sedges (*Carex* sp.), rushes (*Juncus* sp.), spiked rushed (*Eleocharis* sp.), fescue (*Festucae* sp.), bunchgrasses, and bluegrass (*Poa* sp.).

Smaller, higher gradient water bodies may have native willow (*Salix* sp.) species and other hydrophilic species associated with free water. Alteration from natural wet meadows along stream corridors to cultivated areas or pasture areas may have introduced non-native, herbaceous species such as bromegrass (*Bromus* sp.), reed carnarygrass (*Phalaris* sp.), tall wheatgrass (*Agropyron* sp.), orchard grass (*Dactylis* sp.), and rye grass (*Elymus* sp.), along with other non-native species.

Within the Snake River-High Desert Ecoregion, vegetation in the uplands primarily consists of mountain big sagebrush (*Artemisia tridentata*) in wetter, north facing areas and low sagebrush (*Artemisia arbuscula*) in lower, drier locations. Native grasses consist of fescue (*Festucae* sp.), bunchgrasses, and bluegrass (*Poa* sp.).

Woody conifers are usually associated with higher precipitation areas and elevations above 1,140 meters (4,000 feet). Conifer species found in these areas include ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), Douglas fir (*Pseudotsuga menziesii*), white-grand fir (*Picea* sp.), and larch-tamarack (*Larix occidentalis*). There may also be some isolated western juniper (*Juniperus occidentalis*) on the western side of the watershed. Figure 14 shows the land cover in the Weiser River Watershed.

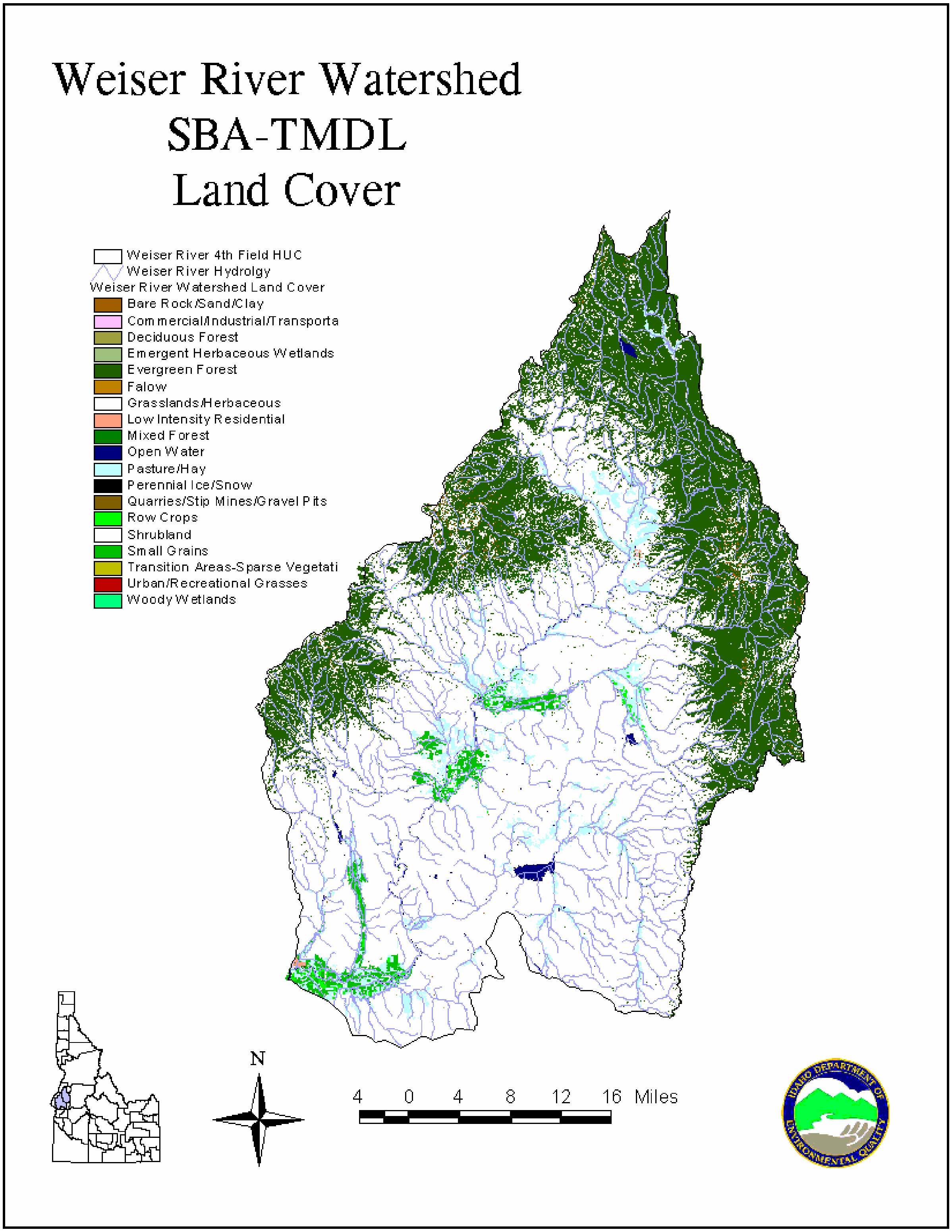


Figure 14. Land Cover. Weiser River Watershed.

Fisheries

Fishery data are available for many water bodies in the Weiser River Watershed. The Idaho Department of Fish and Game (IDFG) completed extensive fish surveys on many segments of the river itself. IDFG and United States Forest Service (USFS) completed numerous studies in smaller watersheds to address bull trout issues. DEQ has conducted limited Beneficial Use Reconnaissance Program (BURP) studies in smaller second and third order water bodies since 1993.

Much of the lower elevation portion of the Weiser River Watershed is dominated by warm water, non-game species, while more cold water species dominate the fisheries higher in the watershed (Cambridge and upstream). Table 4 shows the species encountered at the different locations on the Weiser River.

Table 4. IDFG Fish Survey Results. Weiser River Watershed.

Water Body	Location	Species Encountered[a]	Cold Water Species	Cold Water Species Number	Survey Date
Weiser River	Below Galloway Dam	BLS, CRP, CSL, LND, MWF, NSF, RSS, SMB, SPD, WRB	MWF WRB	MWF, 26 WRB, 2	July 1, 1999
Weiser River	Near Weiser, ID	BLS, CSL, LND, MWF, NSF, SMB, SPD, CAT, LSS, SPD	MWF	MWF, 9	July 1, 1999
Weiser River	In Canyon	BLS, CRP, CSL, MWF, NSF, SMB, SPD, CAT, RSS, SCP, LSS, WRB	MWF WRB	MWF, 3 WRB, 5	June 30, 1999
Weiser River	Upper Canyon	BLS, CRP, CSL, LND, LSS, MWF, NSF, RSS, SCP, SMB, SPD, WRB	MWF WRB	MWF, 9 WRB, 9	June 29, 1999
Weiser River	Midvale	BLS, CSL, LND, LSS, MWF, NSF, RSS, SMB, SPD, WRB	MWF WRB	MWF, 7 WRB, 4	June 29, 1999
Weiser River	Cambridge	BLS, CSL, LSS, MWF, NSF, RSS, SMB, WRB, HRB, MNS	MWF WRB HRB	MWF, 75 WRB, 40 HRB, 1	June 28, 1999

a BLS-bridgelip sucker, CRP-carp, CSL-chiselmouth bass, LND-longnose dace, LSS-largescale sucker, MWF-mountain whitefish, NSF-northern pike minnow, RSS-redsided shinner, SMB-smallmouth bass, SPD-speckeld dace, WRB-redband trout, CAT-channel catfish, SCP-sclulpin, HRB-rainbow trout (hatchery), MNS-mountain sucker

The data presented in Table 4 demonstrate that cold water fish species (trout and whitefish) are present throughout the Weiser River, from Cambridge to the Snake River. However, the dominance of cold water species increases from downstream to upstream segments. This increase in cold water species could possibly be attributed to a variety of conditions, including habitat and/or water quality.

Species found in Weiser River tributaries are identified in Table 5. Most of the data presented to DEQ by IDFG represent two different years and mainly address Keithly Creek, Sheep Creek, and tributaries in the Mann Creek Watershed. It is unclear if only game species were evaluated during some of the surveys conducted on these smaller water bodies.

Table 5. IDFG Fish Data from Small Tributaries: 1995, 1999, and 2001. Weiser River Watershed.

Water Body[a]	Location	Species Encountered[b]	Cold Water Species	Cold Water Species Number	Survey Date
Fourth of July Creek (01)	R5WT14N Sec 8 or 9?	WRB	WRB	51 and 75	July 7, 1995 and June 28, 1999
Hitt Creek	R5W T14N Sec 22	WRB	WRB	52 and 36	July 19, 1995 and July 20, 1995
Spring Creek (02) (Mann Creek)	Not Available	WRB	WRB	84	July 18, 1995
Bear Creek (03)	R5W T14N Sec 16	WRB	WRB	89	July 21, 1995
Adams Creek (04)	R5W T13N Sec 9	WRB	WRB	84	July 21, 1995
Fourth of July Creek (05)	R5W T14N Sec 23	WRB	WRB	33	July 17, 1995
Keithly Creek (01+1)	R4W T14N Sec 29	WRB	WRB	36 and 26	July 27, 1995 and July 18, 2001
Mulmick Gulch (Mann Creek)	Not Available	WRB	WRB	33 and 23	July 23, 1995 and July 17, 2001
Sheep Creek	Near Cambridge	BLS, RSS, SPD	None	None	June 18, 2001

a as identified in Idaho Fish and Game Report
b BLS-bridgelip sucker, RSS-redsided shinner, SPD-speckeld dace, WRB-redband trout

The portion of the Weiser River Watershed upstream from the confluence of the Little Weiser River has been identified as a key watershed for bull trout (*Salvelinus confluentus*). The bull trout has been listed as a threatened species under the Endangered Species Act (United States Fish and Wildlife Service 2002). Local populations of bull trout have been found in the upper Little Weiser River, the East Fork Weiser River, and upper Hornet Creek. Figure 15 shows the key bull trout watershed.

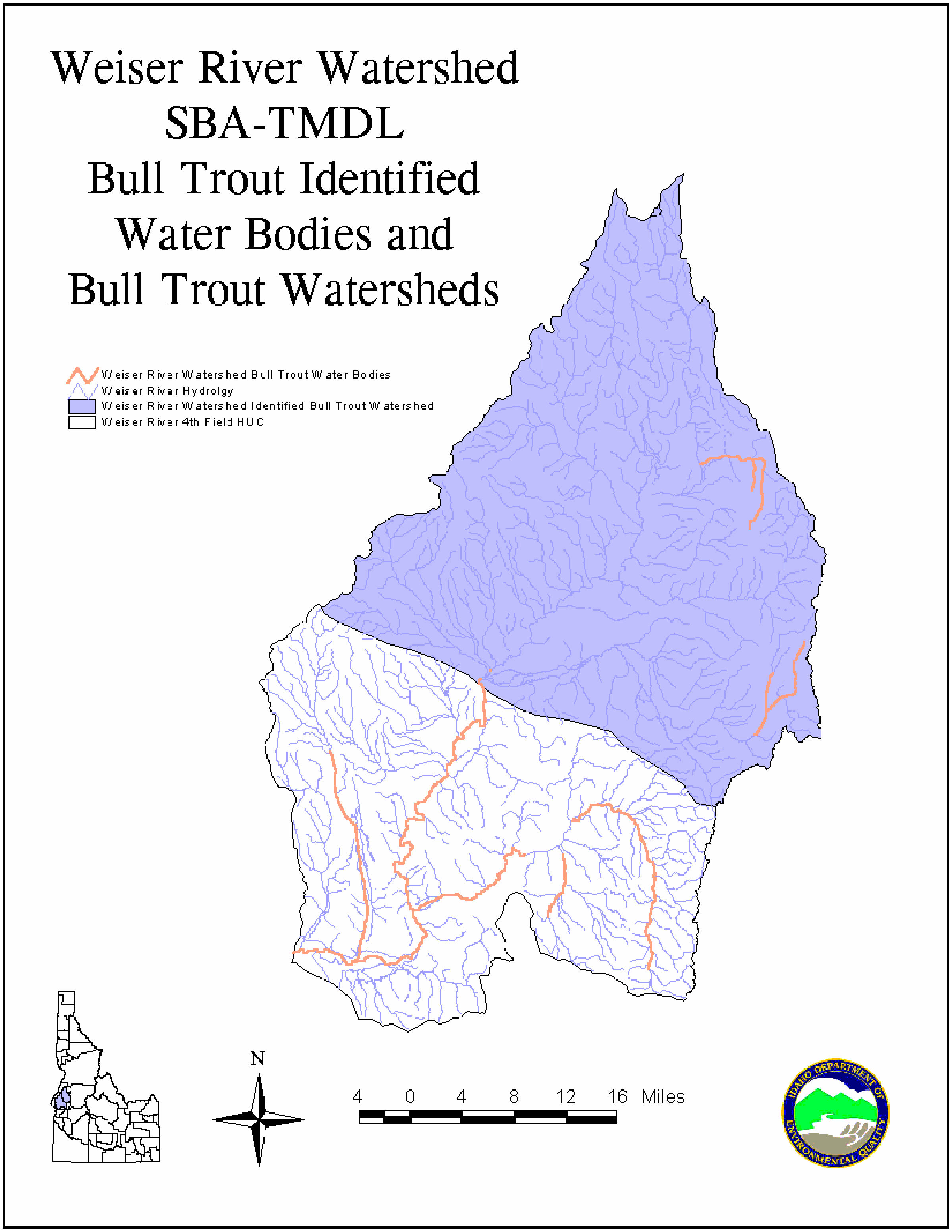


Figure 15. Key Bull Trout Watersheds. Weiser River Watershed.

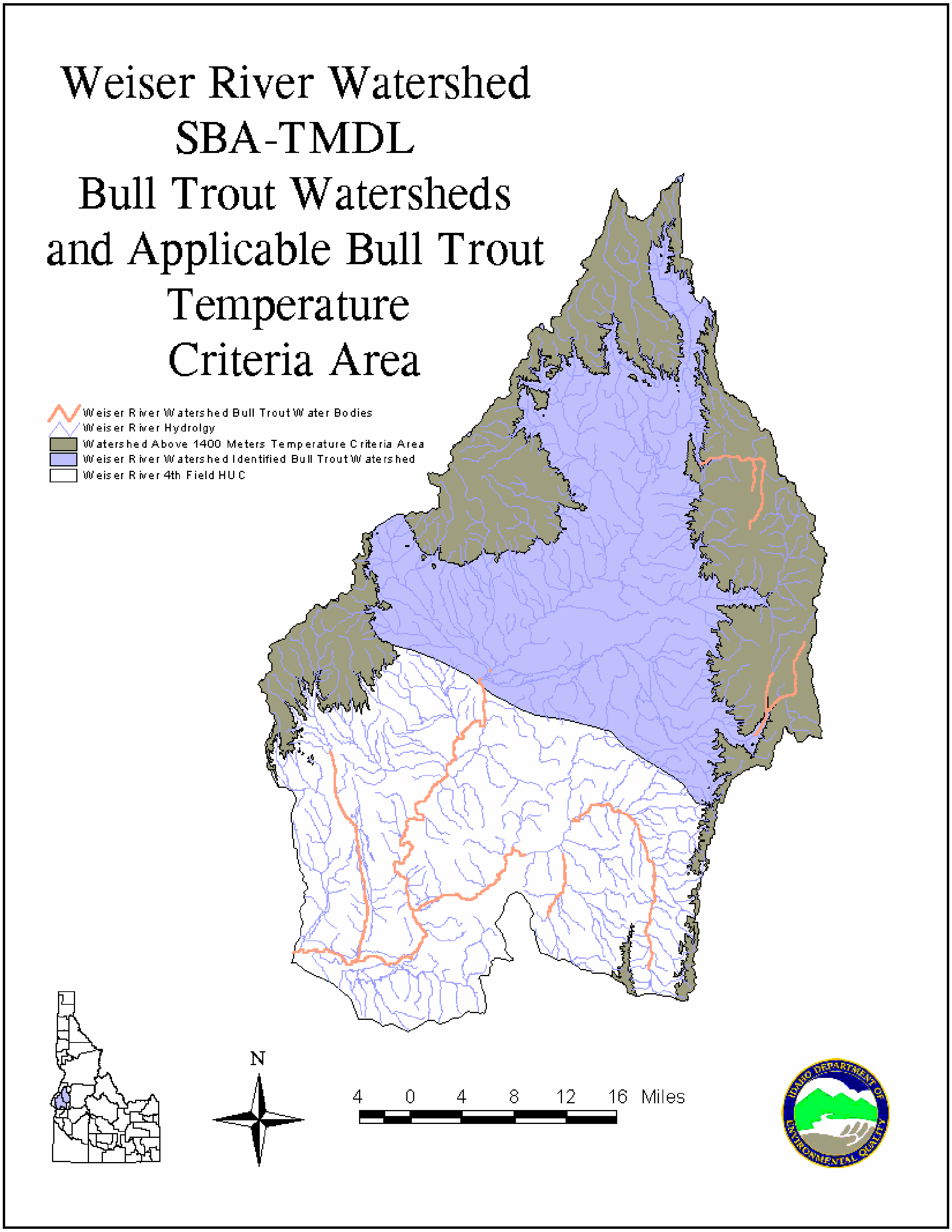


Figure 16. Key Bull Trout Watersheds and Applicable State Water Quality Temperature Criteria Area. Weiser River Watershed.

Subwatershed Characteristics

Most of the fifth field Hydrologic Unit Code (HUC) watersheds do not have the §303(d) listed segments originating in the watershed itself. The only fifth field HUCs that have §303(d) listed segments originating in the watershed are the following:

- Big Flat (North Crane Creek)
- Goodrich-Bacon (Johnson Creek)
- Little Weiser (Little Weiser River)
- Monroe-Mann (Mann Creek)
- West Fork (West Fork Weiser River).

The remaining fifth field HUCs either have a portion of a §303(d) listed segment flowing through them or do not have any listed segments within the fifth field boundary.

Table 6 describes the general characteristics of the fifth field HUCs and any §303(d) listed segments within their boundaries. Figure 17 shows the individual fifth field HUCs and acreage within each. Table 7 describes land use, landform, general elevation, and general characteristics of water bodies discharges.

Table 6. Fifth Field Hydrologic Unit Codes (HUCs), Total Acres, and § 303(d) Listed Segments. Weiser River Watershed.

Fifth Field HUC No.	Fifth Field HUC Name	Total Acres	§303(d) Listed Segment	1998 §303(d) Listed Segment Name
1705012418	Big Flat	64,811	yes	North Crane Creek
1705012417	Crane Creek Reservoir	54,327	yes	Crane Creek Reservoir
1705012408	Goodrich-Bacon	76,498	yes	Johnson Creek
1705012409	Hornet Creek	70,715	no	
1705012405	Keithly Creek	80,693	yes	Weiser River
1705012414	Little Weiser River	129,343	yes	Little Weiser River
1705012404	Lower Crane Creek	56,671	yes	Crane Creek
1705012413	Middle Fork Weiser River	57,714	no	
1705012410	Mill-Warm Spring	39,298	no	
1705012401	Monroe-Mann	166,268	yes	Mann Creek and Weiser River
1705012406	Pine Creek	52,666	no	
1705012407	Rush	59,983	yes	Weiser River
1705012403	Sage Creek	20,677	no	
1705012419	Soulen Reservoir	31,286	yes	South Crane Creek
1705012412	Upper Weiser River	62,086	no	
1705012411	WF Weiser River	54,013	yes	West Fork Weiser River

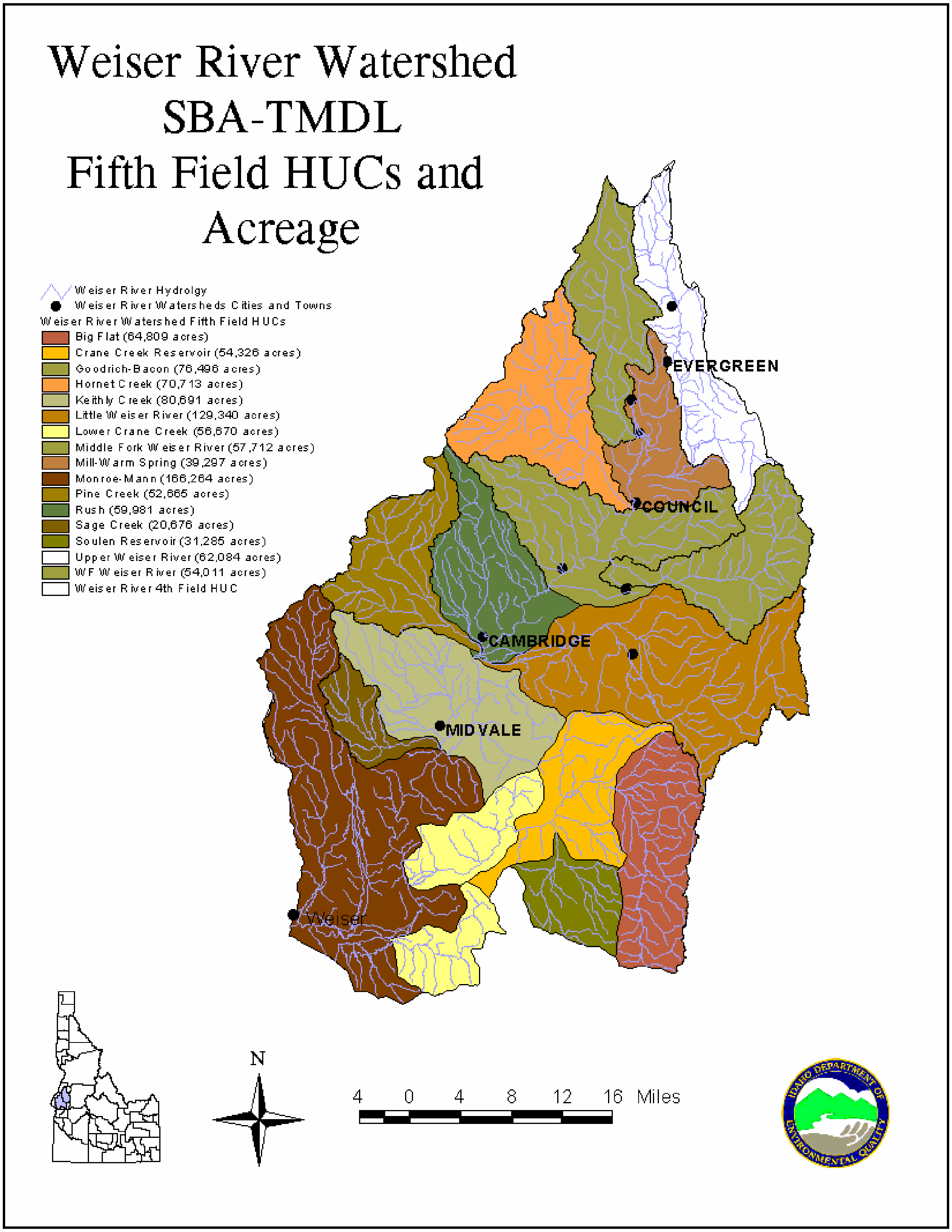


Figure 17. Fifth Field HUCs and Acreage. Weiser River Watershed.

Table 7. Fifth Field HUCs, General Land Use/Landform, Elevation Change, and Hydrologic Regimes. Weiser River Watershed.

Fifth Field HUC[a] Name	Land Use/ Landform	Approx. Highest Elevation (meters)	Approx. Lowest Elevation (meters)	General Water Body Hydrologic Regimes
Big Flat	Irrigated Agriculture, Rangeland, Rolling Hills	1,400	1,000	Ephemeral, Intermittent, and Perennial
Crane Creek Reservoir	Irrigated Agriculture, Rangeland, Rolling Hills	1,000	1,000	Ephemeral, Intermittent, and Perennial
Goodrich-Bacon	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,400	900	Ephemeral, Intermittent, and Perennial
Hornet Creek	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,300	1,000	Ephemeral, Intermittent, and Perennial
Keithly Creek	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,200	900	Ephemeral, Intermittent, and Perennial
Little Weiser River	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,300	900	Ephemeral, Intermittent, and Perennial
Lower Crane Creek	Irrigated Agriculture, Rangeland, Rolling Hills	1,000	800	Ephemeral, Intermittent, and Perennial
Middle Fork Weiser River	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,400	900	Ephemeral, Intermittent, and Perennial
Mill-Warm Spring	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,200	1,000	Ephemeral, Intermittent, and Perennial
Monroe-Mann	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,200	640	Ephemeral, Intermittent, and Perennial
Pine Creek	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,300	900	Ephemeral, Intermittent, and Perennial
Rush	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,300	900	Ephemeral, Intermittent, and Perennial
Sage Creek	Irrigated Agriculture, Rangeland, Rolling Hills	1,700	800	Ephemeral, Intermittent, and Perennial
Soulen Reservoir	Irrigated Agriculture, Rangeland, Rolling Hills	1,500	1,000	Ephemeral, Intermittent, and Perennial
Upper Weiser River	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,300	1,000	Ephemeral, Intermittent, and Perennial
West Fork Weiser River	Irrigated Agriculture, Rangeland, Rolling Hills, Steep Mountains, Forested	2,100	1,000	Ephemeral, Intermittent, and Perennial

a HUC = hydrologic unit code

The highest elevation in the fourth field Weiser River Watershed is Council Mountain at an elevation of 2,474 meters (8,107 feet). The lowest elevation is at the confluence of the Weiser River and the Snake River at an elevation of 638 meters (2,093 feet). As seen in Table 8, a majority of the watershed's elevation is between 840 meters and 1,250 meters (2,577 feet and 4,101 feet). Approximately 50% of the entire watershed acreage is within this elevation range. Table 8 provides the breakdown of the percentage of total acreage within each elevation range. Figure 11 showed the elevations within the fourth field Weiser River Watershed. Figure 13 showed the slopes that could be encountered in the watershed.

Table 8. Fifth Field HUCs, Elevations by Watershed. Weiser River Watershed.

5th Field HUC[a] Name	Percent Elevation 638-842 (meters)	Percent Elevation 842-1,046 (meters)	Percent Elevation 1,046-1,249 (meters)	Percent Elevation 1,249-1,442 (meters)	Percent Elevation 1,442-1,657 (meters)	Percent Elevation 1,657-1,861 (meters)	Percent Elevation 1,861-2,064 (meters)	Percent Elevation >2,064 (meters)
Monroe-Mann	38.5%	27.8%	12.8%	8.3%	6.5%	4.2%	1.5%	0.5%
Sage Creek	5.4%	19.3%	46.3%	20.2%	7.9%	0.9%	0.0%	0.0%
Lower Crane Creek	27.9%	33.8%	38.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Keithly Creek	27.3%	47.3%	11.2%	6.1%	4.1%	2.6%	1.1%	0.2%
Pine Creek	1.2%	9.7%	27.0%	27.6%	12.6%	8.6%	5.9%	5.9%
Rush	15.7%	39.0%	16.7%	8.4%	2.9%	3.2%	5.7%	7.5%
Goodrich-Bacon	1.0%	38.4%	17.0%	11.1%	8.5%	8.8%	9.6%	5.1%
Hornet Creek	0.0%	10.6%	23.2%	29.1%	18.4%	7.5%	6.4%	4.2%
Mill-Warm Spring	0.0%	39.2%	25.6%	19.0%	9.0%	3.9%	2.5%	0.9%
WF Weiser River	0.0%	7.3%	16.1%	14.7%	36.6%	20.2%	4.7%	0.5%
Upper Weiser River	0.0%	0.0%	4.3%	39.3%	26.7%	18.7%	9.1%	1.8%
Middle Fork Weiser River	0.0%	9.7%	8.9%	11.9%	19.4%	20.2%	19.7%	8.9%
Little Weiser River	4.2%	41.0%	13.3%	13.9%	10.9%	7.1%	5.5%	3.7%
Crane Creek Reservoir	0.0%	67.4%	32.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Big Flat	0.0%	10.6%	58.1%	26.2%	5.2%	0.0%	0.0%	0.0%
Soulen Reservoir	0.0%	25.5%	61.8%	11.3%	1.4%	0.0%	0.0%	0.0%
Percent of Total Watershed Acreage	11.1%	28.1%	21.7%	14.6%	10.5%	4.6%	2.5%	2.5%

a HUC = hydrologic unit code

The general aspect (exposure) of the Weiser River Watershed varies, with a little over 29% of the total acreage in the fourth field HUC having a south to southwest exposure (See Table 9 and Figure 18).

The landforms in the southern portion of the watershed are mostly rolling hills with low to moderate slopes. Cultivated agricultural in this area is associated with near river flood prone areas in some places. Numerous irrigation canals provide water to areas miles from the water source. However, most of the land use in the southern section is rangeland, with sparsely forested areas in the Mann Creek Watershed. Sections of the Weiser River flow through canyons where irrigation is not feasible.

Table 9. Fifth Field HUCs, Aspects. Weiser River Watershed.

Fifth Field HUC[a]	Aspect North-Northeast (Acres)	Percent of Total Acreage	Aspect East-Southeast (Acres)	Percent of Total Acreage	Aspect South - Southwest (Acres)	Percent of Total Acreage	Aspect West - Northwest (Acres)	Percent of Total Acreage
Monroe-Mann	44,943.1	27.0%	38,187.2	23.0%	49,963.6	30.0%	33,177.7	20.0%
Sage Creek	5,182.7	25.1%	6,558.6	31.7%	6,540.6	31.6%	2,389.4	11.6%
Lower Crane Creek	16,962.5	29.9%	9,509.2	16.8%	17,615.0	31.1%	12,591.1	22.2%
Keithly Creek	23,582.5	29.2%	21,348.1	26.5%	20,498.1	25.4%	15,263.6	18.9%
Pine Creek	15,006.1	28.5%	14,433.0	27.4%	15,380.6	29.2%	7,843.9	14.9%
Rush	12,889.8	21.5%	19,143.5	31.9%	21,720.0	36.2%	6,235.5	10.4%
Goodrich-Bacon	17,569.4	23.0%	20,467.0	26.8%	22,447.0	29.3%	16,013.5	20.9%
Hornet Creek	22,097.1	31.2%	22,306.4	31.5%	14,133.4	20.0%	12,179.2	17.2%
Mill-Warm Spring	5,335.0	13.6%	7,091.3	18.0%	14,596.0	37.1%	12,280.0	31.2%
WF Weiser River	13,726.2	25.4%	15,365.9	28.4%	16,753.9	31.0%	8,165.7	15.1%
Upper Weiser River	17,359.2	28.0%	12,376.9	19.9%	18,051.3	29.1%	14,286.4	23.0%
Middle Fork Weiser River	9,916.6	17.2%	11,606.6	20.1%	17,415.1	30.2%	18,774.6	32.5%
Little Weiser River	25,401.7	19.6%	21,615.9	16.7%	39,664.8	30.7%	42,655.3	33.0%
Crane Creek Reservoir	18,228.1	33.6%	77,13.5	14.2%	11,067.0	20.4%	17,319.4	31.9%
Big Flat	14,047.6	21.7%	10,744.6	16.6%	17,152.6	26.5%	22,866.6	35.3%
Soulen Reservoir	8,889.1	28.4%	3,599.0	11.5%	8,776.8	28.1%	10,020.2	32.0%
Total		25.2%		22.6%		29.1%		23.1%

a HUC = hydrologic unit code

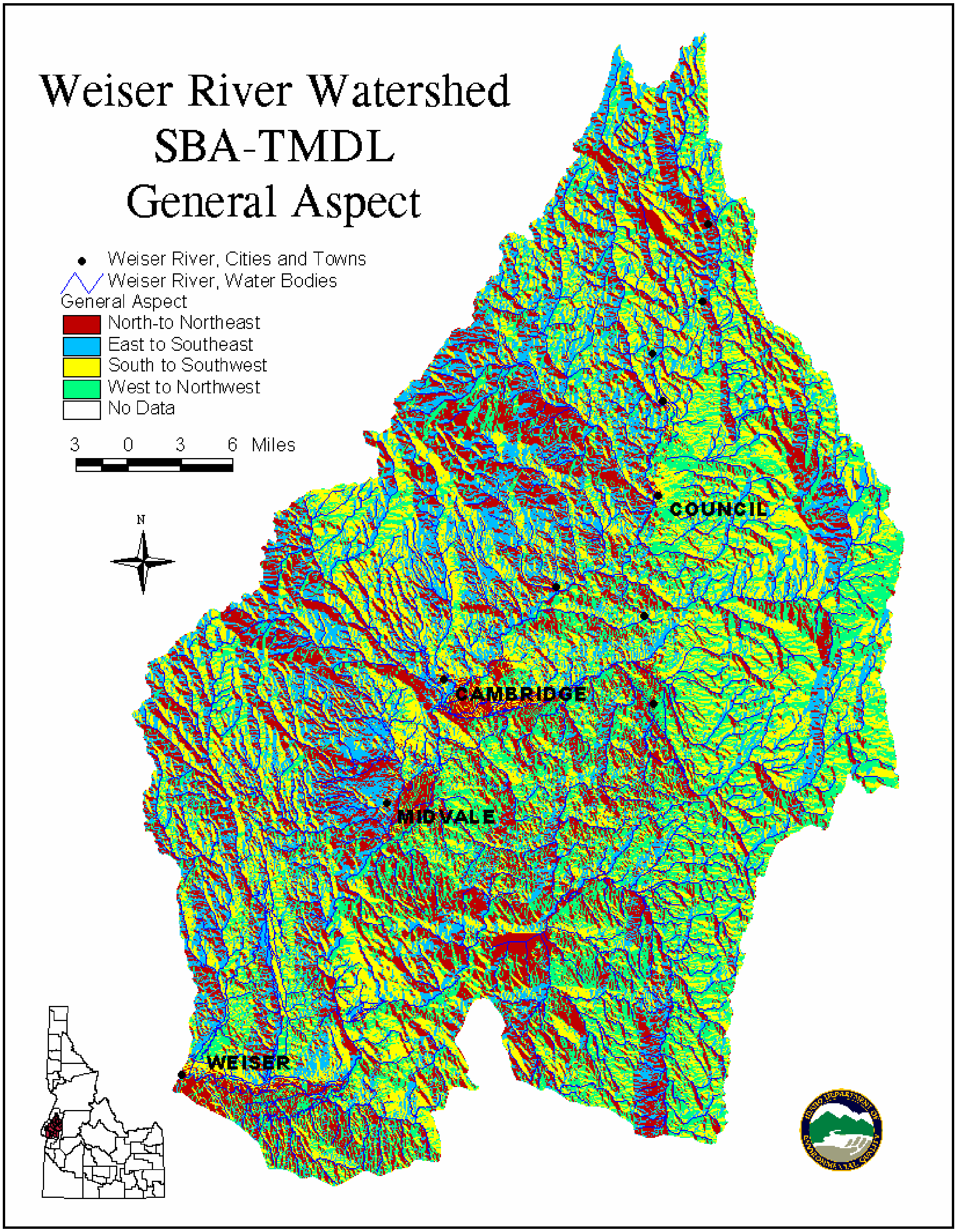


Figure 18. General Aspect. Weiser River Watershed. (DEM Generated Map, Scale Different from Other GIS Generated Maps)

1.3 Cultural Characteristics

Land Use

Land use in the Weiser River Watershed is diverse, with forest areas in the upper elevations, cultivated agriculture in the lower valleys, rangelands, and some urban areas. The watershed lies within two counties: Washington and Adams (See Figure 19). The recognized, established communities include the cities of Weiser, Midvale, Cambridge, and Council.

Gravity irrigated agriculture can be found throughout the watershed. Most of the surface irrigated areas are adjacent or near major rivers and streams. Near the confluence of the Weiser River with the Snake River and the town of Weiser, much of the irrigated areas are on benches (Sunny Slope, for example) or in the Weiser Flats area. In Indian Valley, irrigation water is either diverted from the river, delivered from storage water from the Ben Ross Reservoir, or pumped to the desired location. Near Midvale, irrigation water is diverted from the Weiser River and delivered via irrigation canals. Some dry land agriculture exists as well, but the acreage is small due to the lack of precipitation events during summer months.

Forestlands and rangelands account for the largest percentage of the land. Rangeland is used primarily for open range cattle grazing and is managed through federal allotments or private holdings. Forested areas are primarily managed by federal and state agencies, although some private holdings can also be found.

Table 10 shows the acreage and percent of total land use in the Weiser River Watershed. Figure 20 shows the land use in the watershed.

Table 10. Land Use Classification and Total Acres. Weiser River Watershed.

Land Use	Total Acres	Percent of Total
Forested	368,706	34.3%
Rangeland	625,135	58.1%
Irrigated Flow	62,730	5.8%
Irrigated Sprinkler	15,547	1.4%
Riparian	1,135	0.1%
Urban	883	0.1%
Open Water	2,212	0.2%
Total	1,076,348	100%

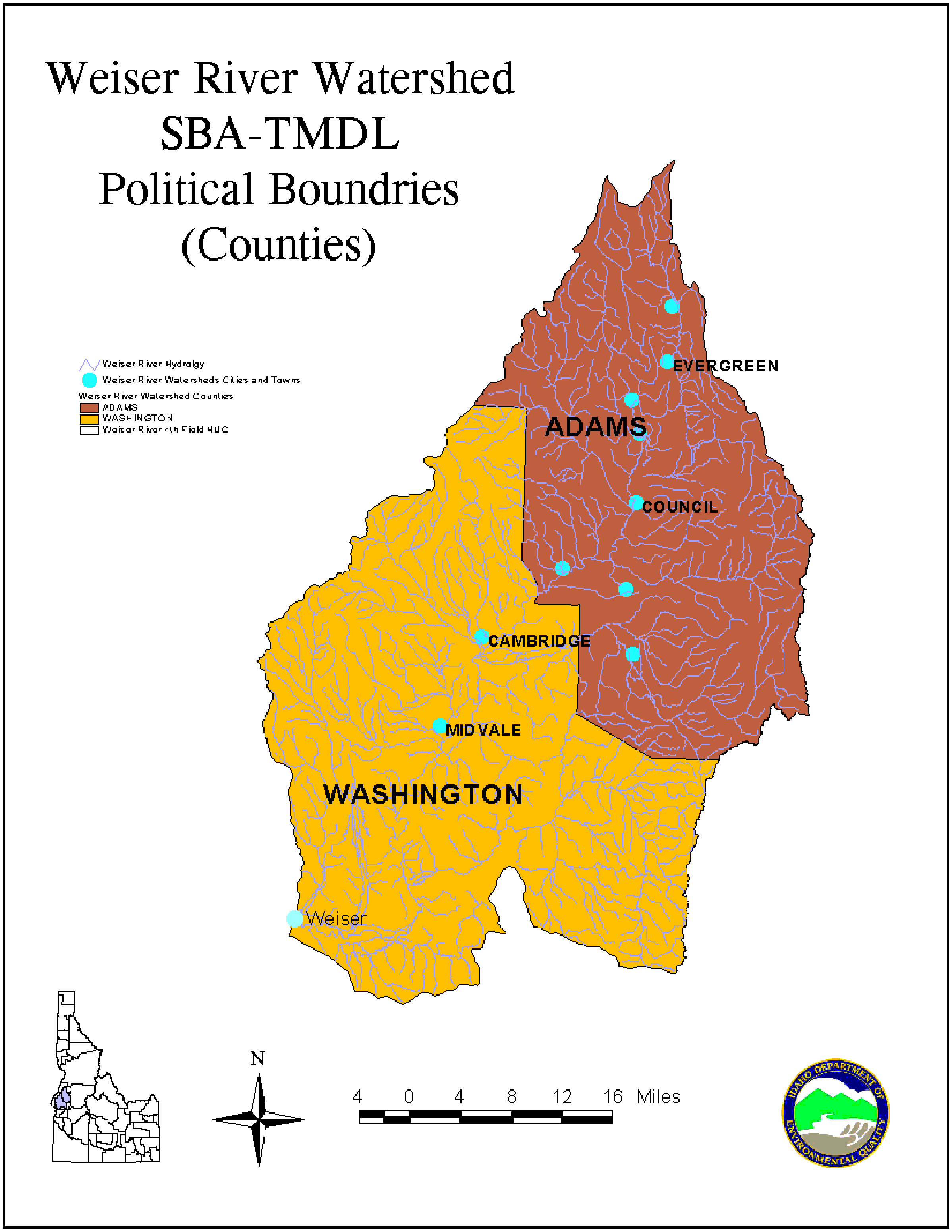


Figure 19. County Boundaries. Weiser River Watershed.

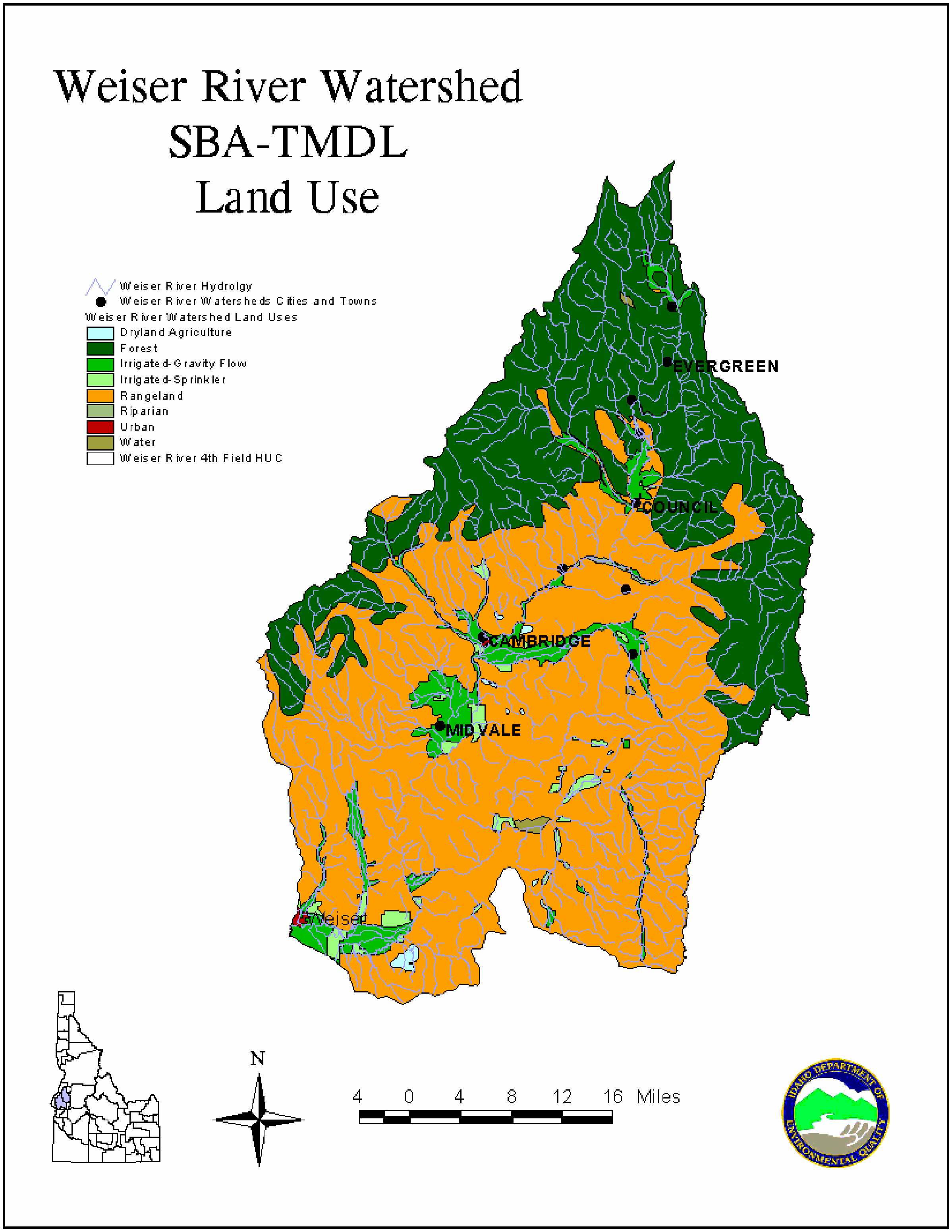


Figure 20. Land Use. Weiser River Watershed.

Land Ownership, Cultural Features, and Population

Land ownership is a mixture of private holdings and state, county, city, and federally managed lands. Much of the private holdings are associated with agricultural areas; a majority of which are family owned homesteads. In the past few years, a growth of “hobby” ranches has emerged between Midvale and Council, Idaho. These tracks are usually 5-40 acres and are derived from larger ranches that once dominated the upland landscape. However, many of these larger ranches still exist as well. These large ranches, in many cases, are cow/calf operations that rely on open rangeland for summer feed. On the irrigated lands associated with the large operations, grass, hay, and small grains are grown for winter feed.

In the more fertile valley bottoms associated with the larger water bodies, irrigated tracks are found throughout the region. Irrigation water is supplied by diverting river water and from irrigation wells. Early water rights date back to approximately the 1880s.

Federal and state lands are usually associated with the rangeland and forested areas. State lands, which are managed for the public school endowment fund, are used primarily for animal grazing or forest products. The Idaho Department of Lands is the primary land manager for state endowment lands.
The Unites States Forest Service and Bureau of Land Management are responsible for managing much of the federal lands within the watershed. Federally managed lands are usually associated with animal grazing, forest products, or recreational uses. Table 11 shows the breakdown by acreage of ownership in the Weiser River Watershed. Figure 21 presents ownership/management in the watershed.

Table 11. Land Ownership/Management. Weiser River Watershed.

Owner/Manager	Total Acres	Percent of Total
Private Holdings	541,854	50.2%
State of Idaho	61,134	5.7%
Open Water	3,490	0.3%
U.S Forest Service	308,406	28.6%
Bureau of Land Management	164,259	15.2%
Total	1,079,143	100.0%

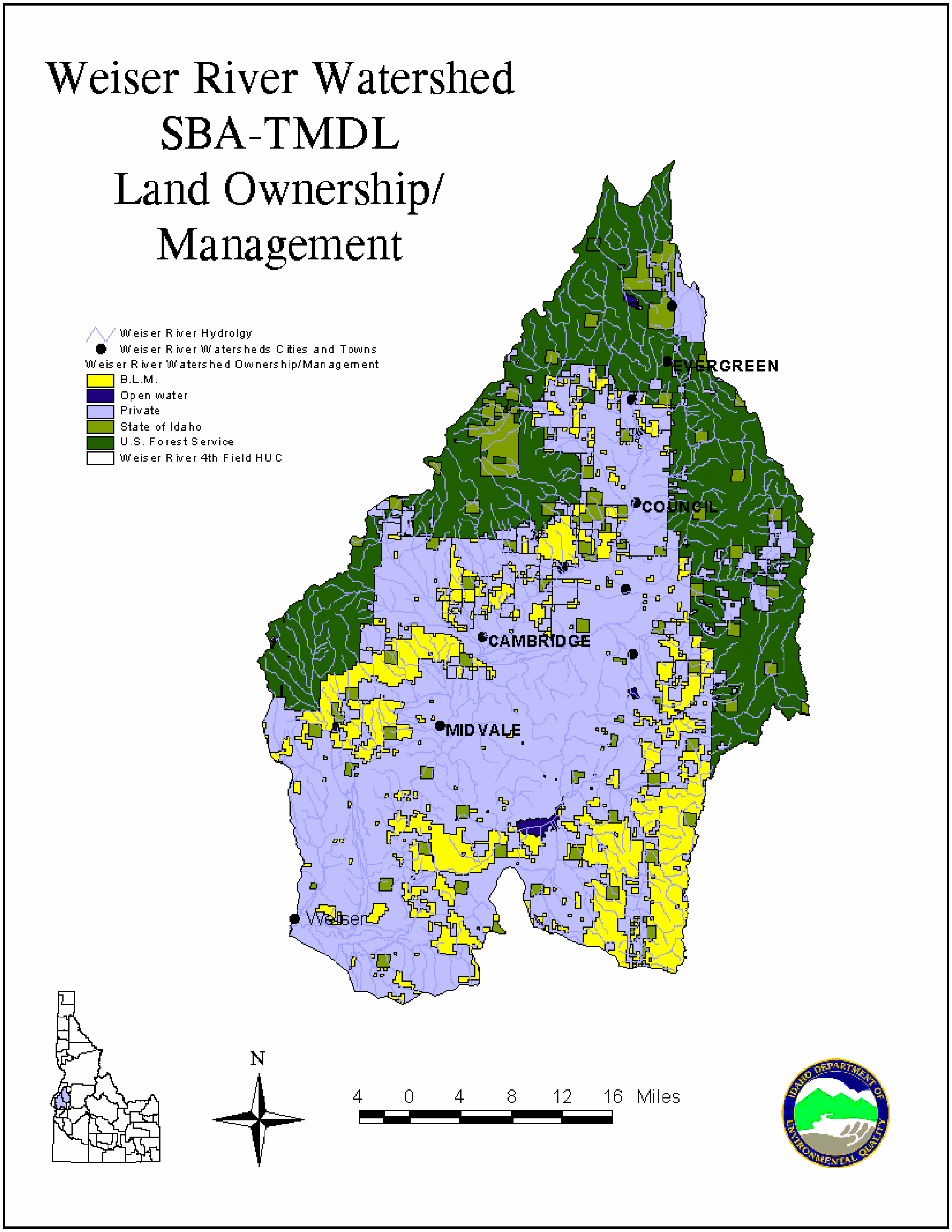


Figure 21. Ownership/Land Management. Weiser River Watershed.

Adams County is almost 100% rural, while Washington County has an almost even split between urban and rural populations. Throughout the entire watershed, the population is associated with agriculture in one way or another. Most of the population is found on small homesteads in the valleys.

Municipalities in the watershed include the cities of Weiser, Midvale, Cambridge, and Council (See Figure 19). Smaller unincorporated communities include Tamarack, Fruitvale, and Indian Valley. These small, unincorporated townships at one time served the agriculture community, but changing economics has forced much of the agricultural infrastructure to the larger cities. Table 12 shows the breakdown of the general demographics between the two counties in the Weiser River Watershed. All statistics in Table 12 were obtained from Idaho Department of Commerce (2001) and the 2000 census (http://www.idoc.state.id.us/idcomm/profiles/index.html) (Idaho Department of Commerce 2001).

Table 12. General Demographics of Adams and Washington Counties. Weiser River Watershed.

Demographics	Adams County	Washington County
Total County Population	3,448	9,977
Population Rural	60.9%	45.2%
Population Urban	39.1%	54.8%
Population Change since 1990	+6.8%	+16.7%
Median Age	44	39.2
Populations of Urban Centers		
Council	816	
New Meadows[a]	533	
Cambridge		360
Weiser		5,343
Midvale		176

a Outside Watershed